PUBLIC WORKS

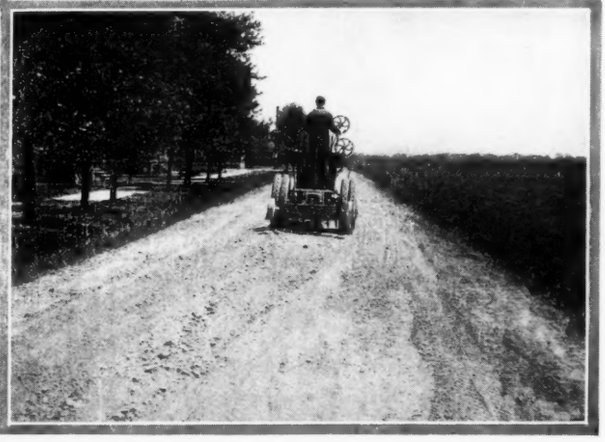
OCTOBER, 1926

REPAIRING WORN OUT ROADS
WITH AN AUSTIN LEANING WHEEL MOTOR GRADER

WORN out stone and gravel roads are not only a nightmare to those who must use them, but a very serious problem for the officials charged wtih keeping them in repair. It does little good to attempt to fill up the holes with new material because it will not bond with the old hard surface. It is next to impossible to reshape the surface with a grader blade because it is altogether too hard. A thorough scarifying and regrading is necessary, and there is no more efficient tool for this purpose than the Austin Motor Grader with scarifier attachment pictured in these photographs.

Illustration No. 1 shows a typical worn out stone road over which it is impossible to drive in comfort at even a most conservative rate of speed. In illustration No. 2 the rear scarifier is loosening the surface from shoulder to shoulder. In No. 3 the blade is being used to level the scarified surface; the leaning front wheels, an exclusive Austin feature, enabling the blade to handle a full load without forcing the front end of the machine into the ditch. Illustration No. 4 shows the smooth surface of the finished road, which is once more ready for high speed traffic.

Austin Motor Graders are furnished with either rear or center scarifiers; and with rubber-tired wheels throughout, or rear Crawler Tread. The coupon will bring you the whole story of these most interesting machines.



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Vol. 57 October, 1926 No. 9

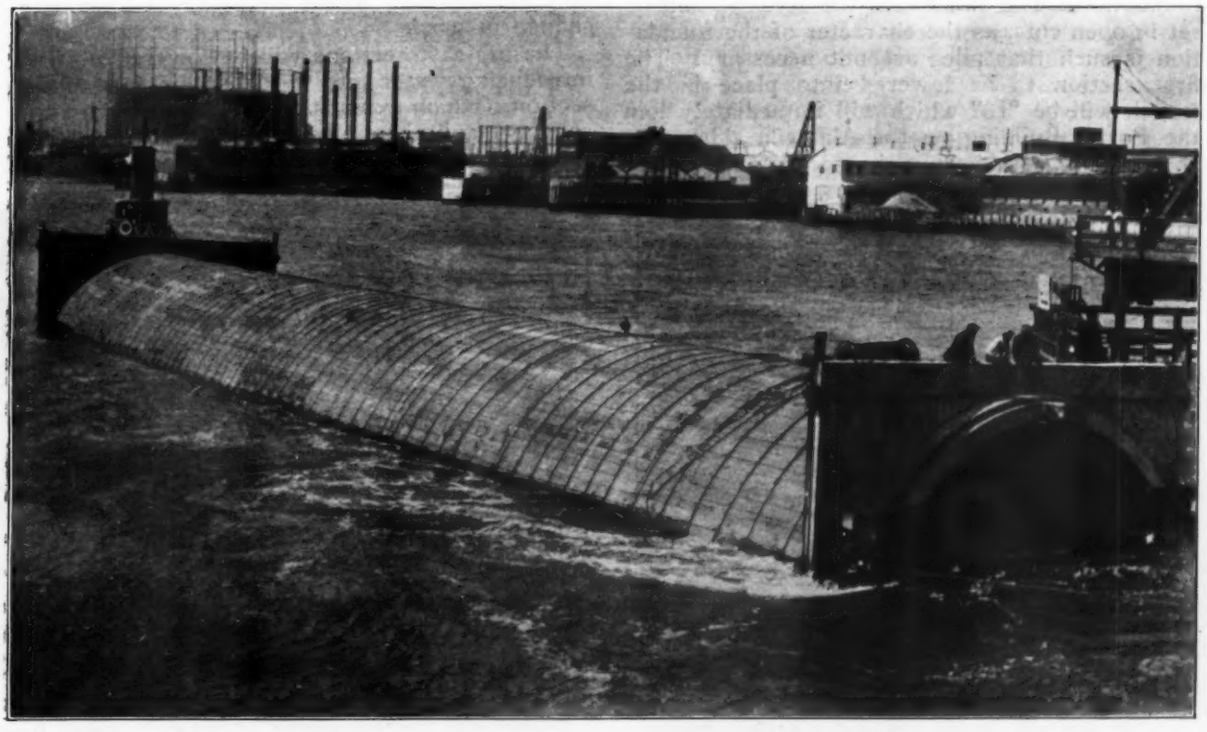
Oakland-Alameda Estuary Subway

Twenty-four-foot roadway and two sidewalks carried in subaqueous tunnel, nearly a half mile of which is being constructed of reinforced concrete in two hundred foot sections, floated to the site and sunk to place in a dredged trench.

By C. W. Geiger

A reinforced concrete subway with a total length of 4,476 feet is now being constructed between Oakland and Alameda, California. The subway (which is known as the Estuary Subway) will take the place of the existing Webster street bridge across the estuary, which the War Department has declared a menace to navigation and an obstruction to the commercial development of the harbor. The subway is being built from a $4,496,000 bond issue fund authorized by the voters of the Alameda County and will provide a roadway 24 feet between sidewalks and a three-foot sidewalk on each side, with a double line of street cars occupying the roadway space. In this way, ample provision is made for pedestrian, vehicular and street car traffic from Oakland to the west end of Alameda.

The subway is being built by the California Bridge and Tunnel Company, the total amount of the contract being $3,882,958.40. The contract entails the construction of a subway and approaches, commencing at the south line of Sixth street in the city of Oakland, and extending along the center of Harrison street, and its extension southerly; thence under the waters of



A PRE-CAST SECTION BEING TOWED UP THE CHANNEL

the estuary and curving into the center of Webster street in Alameda.

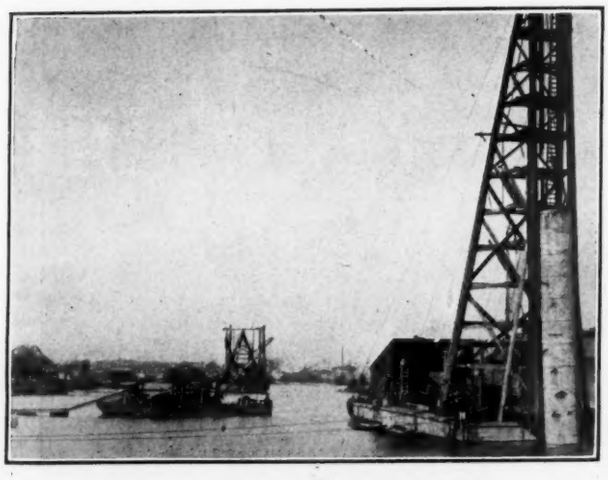
The most interesting part of the Estuary subway is the pre-cast reinforced concrete sections being built in Hunter's Point drydock, nine miles from the subway. This is said to be the first pre-cast tunnel ever constructed and consists of twelve sections, each 203 feet long and 37 feet outside diameter and weighing approximately 5,000 tons each. These reinforced concrete sections will form the subaqueous portion of the subway, extending from just south of First street in Oakland to the Alameda Portal Building. Three of these sections have been completed and towed across the bay. They are now (September 16th) moored at a point near the location of the subway and it is expected that the first section will be sunk into position about September 29th and the other two sections at intervals of 10 days. These three sections are known as sections J, K and L. Four of the pre-cast sections were cast at a time, three being floated out of the drydock at a time, the fourth section being left for the purpose of providing continuous work for the men. Before the water is turned into the drydock, the ends of the sections to be removed are bulkheaded and made water tight. The water is then turned into the drydock and the sections towed across the bay, this requiring three powerful tugs for each section.

A trench is being dredged across the channel to a depth of from 70 to 90 feet and in it sand foundations prepared for the sections. Because of the soft mud on the Alameda side, the two sections next the Portal Building will be supported on a combination wood pile and concrete foundation. The balance of the sections will be set in open cuts, as the character of the foundation is such that piles are not necessary. The first section to be lowered into place in the trench will be "L," which will immediately join the Portal Building on the Alameda side. For the purpose of lowering the sections into place a 100-ton floating pile driver and a 150-ton floating crane will be used, the sections being guided into the proper position in the trench by four quarter lines, a head line, and a stern line, controlled by winches located either on shore or on a pile dolphin. All these lines will be under the control of one man. Instrument men stationed on the shore will secure the exact setting of the sections. Each section will carry two lining masts and four leveling masts for accurate setting.

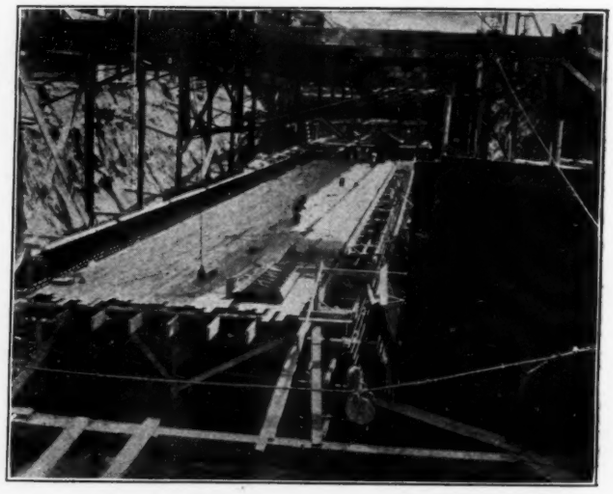
At each end of each section are heavily reinforced brackets holding a 12-inch rectangular collar 40 feet by 38 feet. The pre-cast section will be joined to the Portal Building as follows: A vertical steel sheet pile is cast into each end of the bracket on the end of the section, the webb at right angles to the line of the tunnel and one flange exposed. Steel sheet piles are cast into the side of the Portal Building, one at each side of the tunnel opening, so that, when section "L" has been brought into the proper position, a steel closure pile can be driven, connecting each of the piles cast in the Portal Building to the corresponding pile cast in the bracket of the tunnel section. Tremie concrete will then be placed in the space enclosed by the three piles, the collar and the building to make a water tight joint.

Sections J, K and L are on a 4 degree and 30 minute curve to bring the subway out on the line of Webster street in Alameda. The first six pre-cast sections from the Alameda Portal Building north will be set on a 4½% grade, the seventh and eighth will drop to 0.30% grade, and the last four on the Oakland side will rise on a 4.6% grade. The ends of the pre-cast section are beveled where necessary to make a change in grade.

The pre-cast sections will be lowered by first introducing water into the fresh air duct of the section, (which extends along the bottom of the subway) and then placing sand onto the road slab sufficient to counteract flotation and prop-



SOME OF THE EQUIPMENT USED
In the foreground, 100-ft. floating piledriver setting support for pre-cast section. In center, dredge preparing trench. At left, barge carrying centrifugal pump to clean up mud and laitance.



LOOKING SOUTH FROM THIRD STREET
Constructing covered section of subway. Shows forms and reinforcement for sides and bottom of top air duct.

erly distributed to give an even ballasting so that the pre-cast section will be on an even keel before lowering. When there is no more buoyancy the segment or section will be lowered by means of a 100-ton floating pile driver and a 150-ton floating crane. Divers will be used, of course, in taking care of certain operations.

After a section is in the proper position in relation with the adjacent section, a rubber belt 12 inches wide will be fastened around the joint to insure water tightness. Then a closure sheet pile will be driven which will connect the sheet piles cast in the brackets which surround each end of each section, and which are opposite each other when the sections are in position. Tremie concrete will then be poured around the joint. The trench in which the pre-cast sections have been placed will be filled with sand by the hydraulic method up to the springing line, and mud will be used in filling the rest of the trench to a depth of ten to forty feet over the arch. The sand will give a perfect foundation and the mud will aid in preventing flotation of the tube. After two or three sections have been lowered into position and the back-fill completed, the first section will be unwatered by electrically operated pumps and the bulkhead in one end of the section removed and the remaining interior construction completed, the work within the tube always being carried on behind a number of bulkheads.

All tremie concrete used in the construction of the subway is mixed on a specially built barge equipped with two 1-yard Leach-Oskosh concrete mixers operated by electric motor. The boom for holding the delivery chutes and the tremie pipe is also operated by electric motor. Crushed rock and sand are delivered alongside the barge by barges and the material transferred to the over-head bins by an electrically operated stiff-leg derrick. The sand storage bin has a capacity of 40 cubic yards and the rock storage bin 80 cubic yards. This barge also is provided with storage capacity for 1,300 bags of cement.

CASTING THE TUNNEL SECTIONS

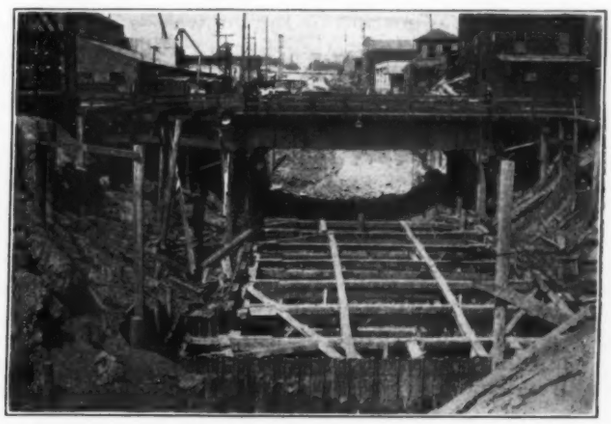
There were a number of interesting features in connection with the casting of the pre-cast sections in Hunter's Point drydock. A specially desiged gantry traveler was constructed, with a spread of 121 feet from rail to rail across the drydock. This has a capacity of 20 tons at any panel point and is equipped with 10-ton chain blocks. This equipment is used for handling the heavy timbers, Blaw Knox forms, and other work incidental to the construction of the sections, as well as for partly lifting or "easing up" on the sections if found necessary when they are being floated out of the drydock.

The forms for sections J, K and L, which are on a curve, were specially designed and built by the Blaw-Knox Company. The outside forms for the invert were made of curved angle-steel, braced, and 2x12 inch planks, in sections 21 feet long. After the outside invert forms had been set and rigidly braced against the sides of the drydock, the inside of the form was covered with a waterproof membrane, consisting of three plies of open-mesh cotton fabric, mopped with hot asphalt one-half Petrolastic and one half Grade "C."

After the reinforcing steel had been placed and the inside Blaw-Knox steel forms set, the invert for the full length of the section up to the level of the road slab, containing 700 cubic yards, was made in one continuous pour. The road slab was then constructed with the use of traveling forms in three sections, each about 70 feet long. A special form for the reinforcing steel on a traveler was then rolled onto the floor slab, adjusted to the right height by jack screws on the traveler, and the reinforcing steel for 70 feet of the arch section placed in position. The outside form was then set and the reinforcing secured to it by bolts. The steel traveler was then lowered and moved ahead 70 feet. A second traveler carrying the semi-collapsible inside arch form was then rolled in, and set in place. The outside arch forms were somewhat similar to the outside invert form. They were in 21-foot sections, with 2x4 foot inspection doors provided about six feet apart vertically and horizontally. The unusual amount of reinforcing steel and stirrups, 232 tons in each 203 foot section, made the job of securing a dense concrete without voids a difficult one. Tamping of the concrete was almost impossible, therefore vibration by means of air hammers against the forms was largely depended upon.

Two ventilation equipment buildings for the

NORTH END OF COVERED SECTION IN OAKLAND
Looking toward the estuary. Building for housing ventilating machinery will be built over this entrance.



BRACING EXCAVATION FOR COVERED SECTION

subway are being constructed, one at each end of the covered portion. These buildings, besides housing the fans and motors for the ventilation, are the entrances to the covered portion of the subway and form a part of it. The contract now in progress includes only the substructure up to a little above the street level. A later contract will be let for finishing the ventilation buildings and providing the ventilation equipment, consisting of blower and exhaust fans and motors; also drainage pumps, wiring, lights, traffic signals and fire protection.

The subway passes through the Alameda Portal Building and then passes out into open cut. This building is 90 feet by 71 feet 6 inches in plan, with the bottom 36 feet below high tide, which required a cofferdam 80 feet by 100 feet and an excavation 42 feet below high tide. The cofferdam consisted of 16x16-inch sheet piling with 3x6 splines 48 feet long, braced at the top by eight longitudinal and six transverse trusses 14 feet deep and framed onto the wales at the line of the sheeting. The foundation for the building consisted of 525 60-foot wood piles driven into the bottom by means of a McKiernan-Terry under-water hammer. The heads of the piles were allowed to project three feet above the broken rock, of which one foot was placed over the soft mud to prevent the mud mixing with the tremie concrete. 290 1-inch dowels attached to steel diaphragms were driven into the piles, after which the bottom was sealed with 5 feet of concrete placed by tremie in one continuous pour, which was allowed to set for 21 days before unwatering.

After the cofferdam had been unwatered the structure floor slab was poured to a depth of four feet. An electrically operated centrifugal pump mounted on a barge was used to clean up the mud and the laitance before concrete was placed under water. This same barge carries a Byers caterpillar crane which is used to lift the suction pipe and to handle light material.

Since Webster Street is the only connecting street from Oakland to the West end of Alameda, it was necessary to provide a detour roadway for street cars and vehicular traffic while Webster street was being excavated, and the contract with the California Bridge and Tunnel Company provided that they construct and maintain such a detour. Most of the work on the Oakland portion of the subway is now being done by the contracting firm of Robinson, Roberts and Rohl, under a subcontract. Steam shovel and dragline excavation, with truck haul, were used almost exclusively on this open cut section. The soil so encountered was a sand and clay that is very stable when kept dry, and the contractors have been able to proceed with their work in a satisfactory manner considering the heavy shoring that was necessary to hold the side slope. A great factor in holding the sides and drying up the bottom of the excavations has been the use of automatic pumping units in sumps, and the use of tile drains at frequent intervals to collect the seepage. These have been successful in keeping down the ground water level.

The general procedure in the construction of the box section known as Type "A" has been to excavate to the grade of the bottom of the concrete ditches and tile drains to dry the bottom and prevent the ground water from rising. A three-inch concrete slab is then poured over the entire bottom and allowed to "cure." Waterproofing membrane is then laid over this slab, and over the membrane to protect it is laid an inch of concrete. On top of this, the main bottom slab is placed. Before the bottom slab is poured, a wall of brick is constructed outside of the side walls to support and protect the waterproofing membrane for the sides. Against this brick wall the bottom slab, side walls and top slab are poured.

The Type "A" subway is box shaped because, as the subway begins to go under ground just above the north line of Fourth street, there is very limited head room under the pavement to be constructed on Harrison street, so the necessary air ducts, four in number, had to be located on the sides of the subway. These air ducts are nearly eight feet square, and extend back into the ventilation building, where they will connect with the exhaust and blower fans.

From Third street to First street the subway is known as Type "C." Owing to the great depth (the bottom being 31 feet below the street level at Third street and 64 feet at First street), the subway here is practically circular in shape, except for a nearly flat bottom, and the air ducts are at the top and bottom. The change of section from Type "A" to Type "C" necessitates a transition section, which is located just south of the south line of Third street. In this section of the subway, which is 37 feet long, the air ducts curve from the sides under and over, so as to bring the fresh air ducts under the roadway slab and the exhaust air ducts above the roadway. This arrangement continues from the south side of the transition section at Third street across to the Alameda ventilating building, also called the Alameda Portal Building.

Owing to the great depth of the excavations, the contractor has driven steel sheet piling to insure holding the sides of the excavation extending from the south line of Third street to the end of the Type "C" subway, 35 feet south of First street, where the Type "D," or floated sections, begin and extend across the estuary to the ventilation building on the Alameda side, or Alameda Portal.

Following is the personnel of the California Bridge and Tunnel Company: A. J. Crocker, president and general manager; Harry Lesser, secretary and treasurer; F. B. Smith, consulting engineer; D. E. Root, general superintendent of construction.

The preparation of plans and specifications for the tube were under the direction of George A. Posey, Alameda county surveyor, as chief engineer. Mr. Posey selected as his chief assistants, Austin W. Earl, designing engineer,

N. D. Baker, office engineer, and L. M. King, specification and construction engineer. Also a board of consulting engineers was appointed consisting of the late C. M. Holland, Prof. Wm. H. Burr and Prof. Chas. Derleth, Jr., and Harry E. Squire was selected chief advisory engineer.

North Carolina Road Test Truck

By H. B. Shaw*

In their road-test truck, the North Carolina State Highway Commission and the Engineering Experiment Station of North Carolina State College have a valuable device for measuring the power required to drive motor vehicles on all sorts and conditions of road.

The unique feature of this test vehicle may be stated briefly as follows:

1. It has an electric drive superimposed upon the usual mechanical drive.

2. The motors are series wound, of the railway or battery vehicle type. The electric generator also is "series wound," which is unusual.

3. Instantaneous and average values of speed and of the electric current in the single main circuit are determined independently. From them, the power delivered to the vehicle mechanism is easily calculated.

4. The road test truck, at specific speeds, measures the average power instead of the tractive resistance. The latter, however, may be calculated from the power, speed, and mechanical efficiency.

5. The vehicle contains a specially constructed "antivibration" suspension for the graphic instruments, voiding the effects of the vehicle vibrations, tilts, and jars.

6. An ampre-hour meter and the elapsed time are used to get the average value of the electric current for a run, instead of averaging the current from the charts of the recording ammeter. This saves much time.

The test vehicle is operated at a selected speed which, for accurate measurements, must be kept constant during a run. It requires some practice to keep the speed constant by manipulation of the throttle of the gasoline engine. The speed commonly used for test runs is 15 miles per hour, though tests have been made at speeds as low as 2 miles per hour and as high as 30 miles per hour.

A feature of this electric drive is that it does not retard the vehicle motion downhill nor will the vehicle measure the power when none is required, as when coasting. Consequently, the brakes have to be used to hold the speed constant on down grades of any consequence.

The vehicle will measure the power at different speeds on hilly roads, the power to pull through mud, sand, etc. To get the comparative horsepower on different road surfaces it is preferable to select fairly level roads and avoid the necessity of calculating and eliminating the effect of grades.

*Director, Engineering Experiment Station, North Carolina State College

A large number of test runs on a race track showed, at 15 miles per hour, the following results:

10.30 horsepower when the surface was wet and muddy.

9.30 horsepower when the surface was partially dried.

8.50 horsepower when the surface was nearly dry and somewhat rough.

5.17 horsepower when the surface was in the best of condition, dry and fairly smooth.

The effect of the speed of the truck upon the horsepower required when the race track was in the best condition is shown by the following results:

At a speed of 2 1-2 miles per hour, 0.67 horsepower.

At a speed of 5 miles per hour, 1.40 horsepower.

At a speed of 10 miles per hour, 3.10 horsepower.

At a speed of 15 miles per hour, 5.17 horsepower.

At a speed of 20 miles per hour, 8.10 horsepower.

At a speed of 25 miles per hour, 12.45 horsepower.

At a speed of 30 miles per hour, 19.00 horsepower.

Analysis of the internal losses, analysis of tractive resistance, recalibration and study of all the functioning of the test vehicle are now being made. The measurements are sufficiently delicate to permit very accurate adjustment of brakes, tests of the effect of different lubricants upon power losses, etc.

When the present laboratory investigations are completed, the test runs are to be resumed and continued for at least a year in order to get all-year, all-weather comparative horsepower for different road surfaces.

The further intention is to use the comparative horsepower as a basis for getting the difference in mileage costs for gasoline, tires, and maintenance resulting from operation on different road surfaces. Neglecting other savings in cost due to hard-surfaced roads, the differences in cost per ton-mile for tires, gasoline, and maintenance can be taken as the differences in cost per ton-mile for different road surfaces, and used to determine the economy of highways.

The results are expected to demonstrate quantitatively the volume of traffic at which expenditures for first-class highways are economically justified, through saving more in the cost of vehicle operation than the additional annual cost of the improved highway.

Kentucky Highway Publication

The Kentucky Highway Commission announces that it will publish a periodical to be known as "Kentucky Highways," which will be the official publication of the department. The commission has made a contract with certain publishers by which the department will furnish

the news matter and edit the magazine while the publishers assume the business management, including the sale of advertising and the planning, as well as the financing of the journal.

Imperial County Sand Hills Pavement

The California Highway Commission has just completed a permanent pavement across the sand hills of Imperial County, the job being one containing several unique features. About seven miles of road across these hills had for several years been a great expense and annoyance to the commission and to tourists crossing the State because of the tendency of the sand hills to travel across the desert with each sand storm, frequently burying the road in spots and requiring it to be relocated or raised. A plank road was built in 1916, largely by public subscription, to furnish a highway across the desert from Yuma, Arizona. This road was eight feet wide, with turn-outs, and was constructed in sections to make it possible to shift or raise it locally, as might be necessitated by the constant shifting of the sand dunes. This plank road deteriorated rapidly and beginning in 1923 a study of conditions there was begun with a view to constructing a more satisfactory highway. Stakes several feet high were placed along a preliminary location to measure the extent of movement of the sand during wind storms. Various types of roadway were given careful consideration. Early studies centered about the idea that the roadway must be of a movable character, but after long consideration of the cost and other objections to such a road, this was abandoned for the idea of a permanent pavement so located as to be above the height of the surrounding dunes and presumably, therefore, free from burial from shifting sands.

One of the difficulties anticipated in constructing any kind of permanent pavement across this seven-mile strip was the entire absence of water for many miles in every direction. No matter what type of road were built, water would be required, and if it were necessary to haul it the cost of the work would be greatly increased. On the chance of finding water underground, the commission began drilling in the middle of the desert and to the surprise of every one obtained a flow of 500 gallons per minute at a dtpth of 92 feet. This well cost the commission $1,350 and saved the State many times this amount in the construction of the road.

After studying the data collected, a location and grade for the road was decided upon. Careful determination was made of the height of such dunes as are likely to encroach upon the new highway and a grade line was established to conform to this height. It is believed to be improbable that the highway at this grade will be engulfed by shifting sand.

The work was performed by Schmidt & Hitchcock of Phoenix, Ariz., their bid being 14½ cents per cubic yard for building the embankment and $7.60 per ton for asphalt concrete. The State assumed liability for sand blown away from the embankment during storms. The asphalt mixing plant was located on the Southern Pacific Railroad 9½ miles from the project. The total length of the contract is 6.45 miles of twenty-foot pavement and the total cost, including a short extension, was $340,000. The contract calls for grading and placing an asphalt concrete pavement in two courses, a base course four inches thick and a two-inch wearing surface. A special feature was that the edges were thickened to nine inches, the specifications providing that this part of the base must be hand tamped. No asphalt was to be placed until after the subgrade had been drenched with water to a depth of three feet, which packed the soft sand into a comparatively firm subgrade. To prevent erosion of the embankment slopes, the contract included the oiling of all shoulders and slopes to form an oil cake. The grading was done by two drag-line outfits working twenty-four hours a day to keep ahead of paving operations.

Preliminary locations for the road were made by F. R. Goodwin under the direction of E. Q. Sullivan, division engineer. F. R. Baker was resident engineer.

Metering Bath (Maine) Water

In their report "To the Inhabitants of the Bath Water District" covering the period from June 30th 1920 to June 30th, 1926, the trustees of the district, which ten years ago acquired the system of the Maine Water Co., advocated metering as follows:

"The largest single item of expense in operating a water system is the maintenance and operation of pumping plants. It is universally considered that the greatest check on this expense is use of metered services. The trustees have referred to this matter in previous reports, and while they feel that it would be too burdensome, at present at least, to require universal metering; they have endeavored to encourage the installation of meters so far as possible. There have been 103 domestic meters added to the system up to January 1, 1926, making a total of 759 meters, of which 663 are owned by the consumers. Of this total 676 are meters of ⅝ths inch capacity.

"In line with this policy of metered services, and beginning July 1, 1924, all public municipal buildings in Bath, which in the past had had free service, were metered. The elimination of the free service was simply in compliance with the present laws against discrimination to any consumers, public as well as private; but in lieu of this free service, the District was able to make a reduction on hydrant rentals of $4.00 each on the first 100 hydrants, and 50c each on all additional hydrants; making a total decrease in hydrant rental to the city of $458.50 annually. The present hydrant rental is $42.00 each for the first 100 hydrants and $34.00 each for all additional hydrants. As against this it is interesting to note that Calais, which is the only remaining plant of the extensive system formerly owned and operated by the Maine Water Company, is paying a rental of $100.00 for each of its first 100 hydrants, and $55.00 apiece for all additional hydrants."

Thin Brick Pavements

Accelerated traffic tests, and investigation of pavements in service for a number of years, appear to show conclusively that 2½" brick make as satisfactory a pavement as 3" or 4".

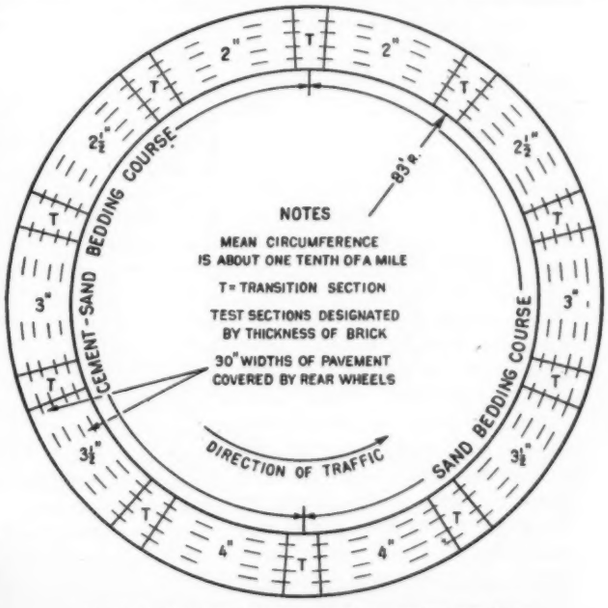
Taking cognizance of the growing belief among engineers that pavements can be laid with brick three inches thick, some maintain even two inches, with results as satisfactory as when four-inch brick were used, the Bureau of Public Roads during the past few months has been investigaitng the subject both by making an accelerated traffic test at Arlington, Va., of sections of pavement built of brick of different thicknesses, together with laboratory tests of the same brick; and also by making a field study of the service behavior of brick pavements in which these thinner brick have been used.

In order to eliminate, so far as possible, all variable factors except thickness of brick in making the traffic test, all brick were obtained from one manufacturer. They were of the vertical fiber, plain wire-cut, lugless type, 8½ inches long by 4 inches wide. The depths used were 2, 2½, 3, 3½ and 4 inches. Two sections of pavement using each of these thicknesses were laid, one on a ¾-inch bed of plain sand and the other on a ¾-inch bed of 1 to 4 mixture of cement and sand.

This test pavement was laid on a circular base which had formerly been used for testing bituminous pavements and was in perfect condition. This track is shown in the accompanying illustration. Each section was about forty-five feet long; the successive sections being separated by others about ten feet long, called transition sections, in which the change from one thickness to another was made on a bedding course which was stiffened by the addition of a small quantity of Portland cement. Because of the curved shape of the track, it was necessary to introduce at intervals wedge-shaped sections, or "dutchmen," one of which is shown in figure 2. One of these was placed in the center of each test section and one in each transition section, or twenty altogether. In this way a uniform width of joints was maintained throughout the entire pavement.

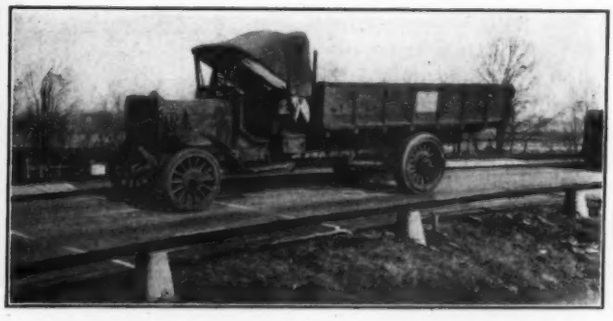
After the brick had all been laid, the pavement was rolled with a three-ton tandem roller, brick that were damp were dried with a kerosene torch, the pavement was culled as in ordinary construction work, and the joints were then filled with asphalt of 32 penetration applied at a temperature of 375 to 400 degrees Fahrenheit. The pavement was constructed late in November of 1925 and because of the low temperature the joints were not as thoroughly filled to the bottom as would have been possible in warmer weather. Following the filling of the joints a light coat of sand was spread and the pavement again rolled. The different sections were then indicated by radial painted lines, and traffic lines concentric with the edges of the pavement were painted on the surface with a view to confining the truck wheels to a path thirty inches wide and thus accelerate the test.

In making the test, motor trucks equipped with solid rubber tires were used, and often

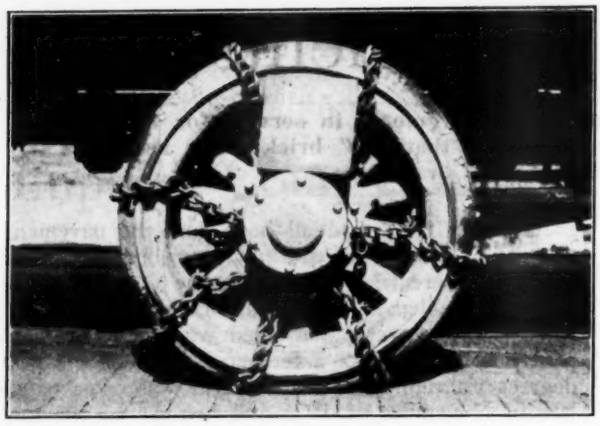


GENERAL PLAN OF BRICK TEST TRACK.

BRICKLAYER CLOSING IN A "DUTCHMAN."
This feature was necessary to compensate for the curvature of the test track.



TYPE OF TRUCK AND SOLID TIRES USED DURING THE FIRST PHASE OF THE TEST.

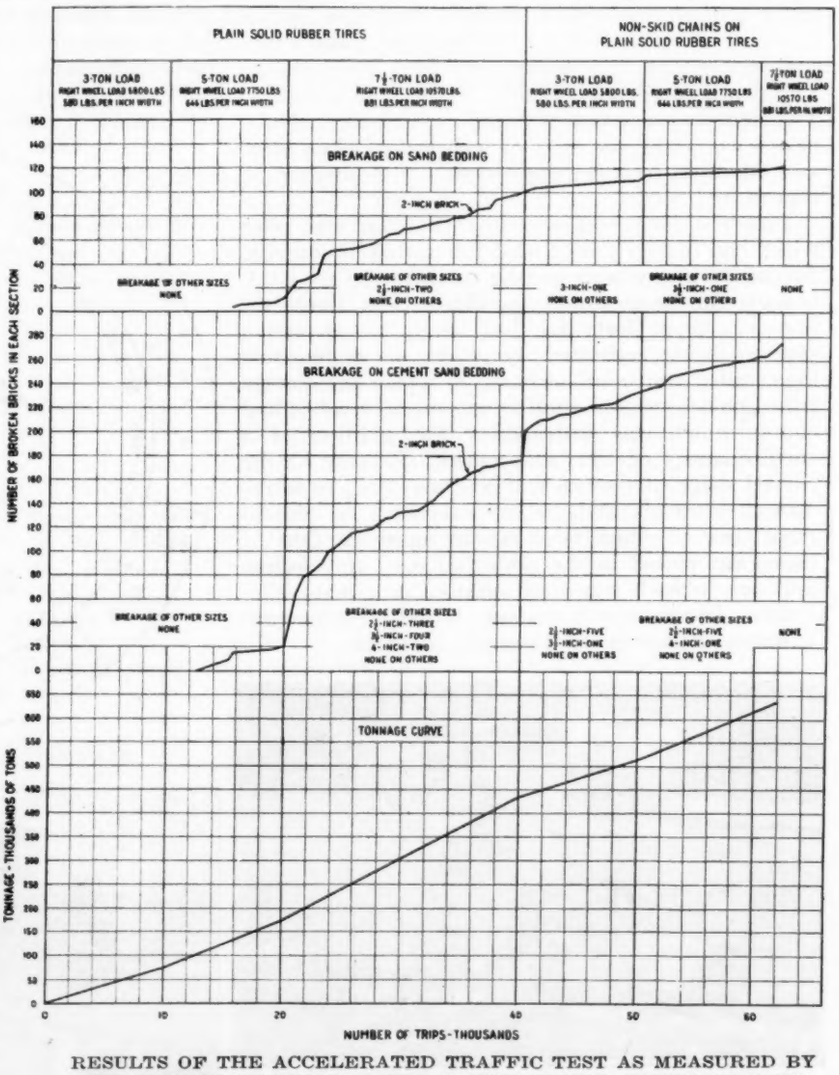


TRUCK WHEEL EQUIPPED WITH NONSKID CHAINS DURING THE SECOND PHASE OF THE TRAFFIC TEST

these had made 40,000 trips. Trucks were used equipped with heavy non-skid chains on the rear wheels. During the test without chains, ten thousand trips were made over each section with a 3-ton load, ten thousand with a 5-ton load and twenty-thousand with a 7½-ton. The 3-ton load gave 5,800 pounds maximum wheel load and 580 pounds load per inch of tire width. Five-ton loads gave 7,750 pounds maximum wheel load, with 646 pounds per inch of tire width. Seven - and - a - half-ton loads gave 10,570 pounds maximum wheel load and 881 pounds per inch of tire width. These trucks were driven at twelve miles per hour. As the track had a super-elevation calculated for nine miles, this gave a greater pressure on the wheels furthest from the center, the effect of which was shown in the wear upon the pavement. It was found, however, that with chains on the tires the trucks could not maintain a speed over nine miles an hour without overheating and this speed was used for those trucks. The test with chains consisted of ten thousand trips of the 3-ton, ten thousand of the 5-ton and two thousand two hundred of the 7½-ton; the maximum wheel load and load per inch of tire width being as given above. The chains used were one-half inch diameter, rising 1⅛ inches above the tire, seven chains being used with the 3-ton load and eight chains with the other two.

The results of the test were ascertained in terms of the total number of brick in the two 30-inch wheel strips of each section that were broken transversely under such load. These results are shown in the diagram. A study of this diagram shows that:

1. Practically all transverse breakage occurred in the 2-inch brick sections.
2. Within the limits of the test, resistance to breakage by the 2½-inch brick appears to have been but slightly less than that of the thicker brick.
3. Breakage in sections laid on sand bedding is less than half of that occurring in sections laid on cement-sand bedding.
4. The greatest amount of breakage occurred during the application of the 7½-ton load with plain solid tires.
5. The greatest increase in breakage occurred during the first 10,000 trips of the 7½-ton, plain-solid-tired traffic.
6. The rate of breakage greatly decreased



RESULTS OF THE ACCELERATED TRAFFIC TEST AS MEASURED BY THE NUMBER OF BRICK IN THE 30-INCH WHEEL STRIPS OF EACH SECTION, BROKEN TRANSVERSELY UNDER EACH LOAD IN THE TWO PHASES OF THE TEST; AND CURVE SHOWING THE TONNAGE TO WHICH THE BRICK WERE SUBJECTED

under the traffic following completion of the 7½-ton, plain-solid-tired traffic.

The high resistance to breakage shown by the 2½-inch brick was one of the important results obtained from this test. The slightly better quality indicated by the physical tests (referred to below) can only partially explain the remarkable strength of this brick under severe traffic conditions.

The marked contrast in breakage occurring on the two types of bedding course strikingly demonstrates the superiority of the plain sand over the cement-sand bedding, at least for the heavy-traffic pavements.

The high rate of breakage occurring during the early traffic was probably due to the existence in each section of a few bricks that were slightly warped or of a poorer grade, which brick broke readily under the lighter loads.

After the completion of the test, brick taken from the pavement were subjected to tests for rattler loss, modulus of rupture and crushing strength on edge. The results of these tests are shown in the accompanying table. It appears from this that the 2¼" brick were apparently of slightly better quality than the others. The figures of rattler loss, as indicated by the table, are not considered fair to the smaller sizes, the engineers of the bureau believing that the loss by brick in a rattler is more nearly a function of the total length of edge than of the weight of the brick and that a modification of the standard rattler test recognizing this fact should be made. If corrections of the rattler test be made in accordance with this idea, the figures for rattler loss would arrange themselves in practically the same order as those for rupture and crushing strength, the order of

Results of Physical Tests on the Brick Used in the Test Pavement at Arlington Experiment Farm, Va.

Brick thickness	Rattler loss by weight	Modulus of rupture		Crushing strength on edge
		Tested flat	Tested on edge	
Inches	Per cent	Lbs. per sq. in.	Lbs. per sq. in.	Lbs. per sq. in.
2	22.8	2,088	1,991	10,240
2½	18.8	2,461	2,197	12,530
3	19.0	2,115	1,964	10,770
3½	17.0	2,233	2,146	10,916
4	16.8	2,117	1,998	10,850

BRICK OF THE DIFFERENT SIZES TAKEN FROM THE TEST PAVEMENT AFTER TRAFFIC.

The group shows the extreme variations in the condition of the brick after the service tests.

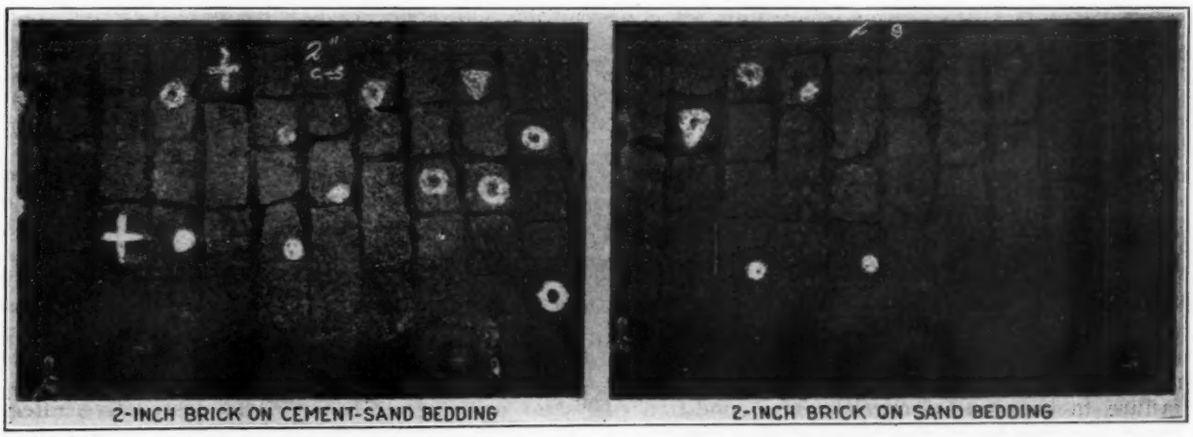
excellence of the several sizes being as follows: 2½", 3½", 4", 3" and 2". The fact that the 2" brick were the poorest was probably due to the fact (referred to later) that it is very difficult to burn brick as thin as two inches without warping or other defects.

A study of the track during and after the completion of the test showed that practically all the damage before the application of the chains was limited to transverse breakage. After the chains had been used there was some cobbling or breaking off of the edges, most of it occurring during the early part of this test, the wider the spacing between the bricks the greater the amount of cobbling.

Very little difference was apparent between the conditions of the various sections of brick larger than two inches, all being in almost perfect condition at the completion of the test. The two-inch brick, however, showed marked effects of the heavy traffic.

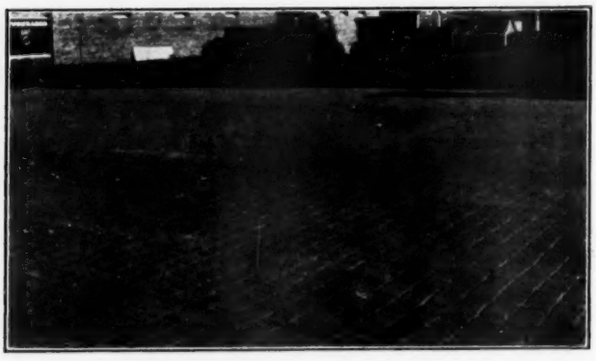
Although the amount of transverse breakage has been taken as the criterion of the relative service of the several thicknesses of brick it must be understood that the transverse breakage alone did not materially affect the condition of the pavements. The broken portions remained in position, and under the plain solid-tired traffic did not ravel or scale at the cracks except in the 2-inch sections. The number of brick broken during the entire test was less than the number that would ordinarily be broken during the rolling of a brick pavement.

During the test 62,200 trucks passed over the thirty-inch strips and about one-third of them



LOOKING DOWN ON TWO 2-INCH SECTIONS AFTER COMPLETION OF THE CHAIN-EQUIPPED TRAFFIC.

Solid circle indicates break under 3-ton and 5-ton loads on plain solid tires. Open circle indicates break under 10,000 trips of 7½-ton load on plain tires. Triangle indicates break under 10,000 more trips of 7½-ton loads. Cross indicates break under above plus 10,000 trips of 3-ton load with tire chains and 10,000 of 5-ton with chains.



DETAIL VIEW SHOWING CONDITION IN FEBRUARY, 1926, OF THE 2½-INCH BRICK LAID AT OKEEMAH, OKLA., IN 1920 ON A 5-INCH CONCRETE BASE WITH GROUT FILLER.

were equipped with non-skid chains. These figures were compared with figures of actual traffic which had been taken on a number of roads and from these it was estimated that the traffic to which this test pavement was subjected was equivalent to from five to forty-five years of such traffic as passed over six of the most important truck carrying highways in Cook County, Ill. If allowance is made for the large percentage of the time during which chains were used, the length of service use for equivalent wear on the pavement would be approximately double this, since chains are ordinarily used only about two months of the year.

THE FIELD SURVEY

While the above test was being made at Arlington, information was being gathered concerning pavements of thin brick which had been in actual service. Pavements built of brick less than three inches deep which had been in service for a considerable length of time were found to be limited almost entirely to portions of Texas, Louisiana, Oklahoma, and Nebraska. Pavements were studied in Greenville, Sulphur Springs, Texarkana, Tyler, Temple and Fort Worth, Texas; in Okmulgee, Henrietta, Wetumka, Okeemah, Oklahoma City, Oklahoma County, Ponca City, Tonkawa and Blackwell, Okla.; and in Omaha, Nebraska.

Every effort was made to obtain, through consultation with local engineers and highway officials, accurate information regarding all conditions which might influence the behavior of each pavement, and also their views as to the adequacy of the particular pavement to meet the traffic requirements. Special account was taken of whether or not the authorities indicated their confidence in the thinner brick by continuing to employ them in later construction. A detailed inspection was made of several million square yards of pavements in which 2½ and 2¼-inch brick were used.

Typical comments made by the investigators were: "These pavements were in nearly perfect condition, alhough they had received no maintenance except at a few locations where failure in base had occurred. The condition of these pavements at the time of the inspection was good, although some failures had occurred in the bases apparently from bad subgrade conditions." "These pavements were in perfect condition and had received no surface maintenance."

Of the Ponca City streets of 2½-inch brick it was said: "The main streets are said to have greater traffic than any other city streets in Oklahoma. . . . All these pavements were in almost perfect condition and had had no maintenance up to the date of inspection." (After one to six years wear.)

Practically the only adverse comments made referred to a few streets where approximately a half-inch of asphalt mat had been placed over the brick, presumably in applying the filler, which mat had peeled in spots and given a rough pavement. The accompanying table gives a summary of data of the field survey at several of the cities.

Most of the cities showed their approval of the thin pavements by using them in increasing quantities during subsequent years. The general comment made was that "The pavements built with 2½-inch brick, in most cases, were in good condition. In a few localities failures had occurred in the base causing displacement in

CONDITION OF 2½-INCH BRICK SURFACE LAID AT GREENVILLE, TEX., IN 1914, AS IT APPEARED IN FEBRUARY, 1926.

Displacement of the brick has occurred over a base failure without breaking the brick.

the brick. It was particularly noted that in such cases displacement in the brick had taken place without breakage. This was found to be true also for the brick over transverse and longitudinal cracks. In general, the brick surfaces were found to have had very little maintenance, except at places where failure had occurred in the base." Contractors in Oklahoma, where five-year maintenance is included in the contract, without exception declared that no allowance is made in bidding for 2½" brick as compared to 3" because of maintenance costs.

It was found that during the later work a ¾-inch bedding course has been used in place of thicknesses up to 1½ and 2 inches used in earlier years. Fine sand where used had been found to be objectionable because of a tendency to work up between the bricks. Bricks laid on a thin bedding of coarse sand on a base with a smooth surface maintained a smoother pavement surface than others using greater depth of sand or rougher bases. The destructive effect of motor truck traffic depends to a large extent on the smoothness of the pavement, which re-

Summary of Data of the Field Survey

Location	Thickness of brick	Type of brick	Area laid	Year laid	Character of streets paved	Remarks
	inches		sq. yds.			
Greenville, Tex.....	2¼	Repressed	12,000	1905-06	Main	First brick to be laid flat
Do	2½	Wire-cut vertical fiber	90,000	1914	Main and residential	No 3-inch brick laid
Sulphur Springs, Tex.	2½	do	60,000	1915	do	
Do	3	do	(1)	1915	do	No 3-inch brick laid since
Tyler Tex.....	3	do	40,000	1920	do	Do
Do	2½	do	140,000	1925	do	
Temple, Tex.....	3	do	(1)	Before 1923	do	Do
Do	2½	do	100,000	1915-1925	do	
Okmulgee, Okla.....	2½	do	220,000	1916-1923	do	
Do	3	do	30,000	Before 1921	do	Do
Henryetta, Okla.....	3	do	25,000	1917	Main	Do
Do	2½	do	200,000	1917-1923	Main and residential	
Wetumka, Okla.....	3	do	12,000	1924-25	Main	
Do	2½	do	50,000	1924-25	Residential	
Okeemah, Okla.....	2½	do	35,000	1920	Main and residential	No 3-inch brick laid
Ponca, Okla.....	2½	do	500,000	1919-1925	do	Do
Tonkawa, Okla.....	2½	do	110,000	1919-1923	do	Do
Blackwell, Okla.....	2½	do	325,000	1913-14	do	Do

[1]Not known.

duces the impact of the truck, and any slight increase in construction cost for obtaining and maintaining a smooth surface will be more than justified by the potential increase in life of the pavement.

Thin brick pavements were found laid on bases of concrete, macadam, and natural soil. It was concluded from the investigation that "Any material that remains stable at all times would appear to make a satisfactory base for a brick pavement. . . . An old macadam or other type of surface that has proved stable under traffic should prove entirely satisfactory as a base for brick."

Concerning the opinion of resident engineers and officials familiar with these thin brick pavements, the investigators report that "All of the officials interviewed from those sections of the country where brick of less than three-inch thickness is being used expressed themselves as favorable to the use of the thinner brick, some with and others without limitations as to the type of street and traffic. Many maintained that 2½-inch brick would prove equally as satisfactory as the 3-inch thickness under all conditions, and others believed that the 2½-inch type should be limited to use on residential and outlying business streets."

Several manufacturers were interviewed as

THE IMPORTANCE OF LIMITING THE QUANTITY OF ASPHALT FILLER TO THAT REQUIRED TO FILL THE SPACES BETWEEN THE BRICK IS ILLUSTRATED BY THE CONDITION OF THIS 2¼-INCH BRICK PAVEMENT IN TEXARKANA, TEX., THE PAVEMENT WAS LAID IN 1922.

DETAIL VIEW OF 2½-INCH BRICK LAID ON PARKER STREET, OMAHA, IN 1915.

The brick were laid on a 5-inch concrete base with bituminous filler. The photograph shows the condition of these brick in 1926 after eleven years under medium traffic.

to the relative difficulties of manufacturing different thicknesses and were found to be favorable to the manufacture of the 2½-inch brick, although when they first began manufacturing these there had been some difficulty in burning. Some manufacturers, however, believe the manufacture of 2-inch brick to be impracticable because of the loss occurring from warping during burning.

A rough calculation made by the investigators of the saving in cost by using the thinner brick resulted in the estimate that there would be a saving of ten percent in manufacturing and of sixteen percent in freight, haulage and filler, with each half inch reduction in thickness.

These investigations have been completed and a report upon them made recently by L. W. Teller, Engineer of Tests and J. T. Pauls, Associate Highway Engineer, of the U. S. Bureau of Public Roads. Their analysis of the data obtained seems to them to warrant certain conclusions, among which the more important are the following:

1. That 2½-inch brick of the quality used in the Arlington traffic tests, when properly supported, will prove satisfactory for pavements carrying the heavier types of traffic.
2. That brick of 2-inch thickness, when properly supported and of the quality used in the tests, will be adequate for pavements on streets carrying the lighter types of traffic.
3. That a bedding course of plain sand is more effective in reducing breakage of brick than a cement-sand bedding course, the breakage being much less on the former than the latter. The depth of the sand bedding course should not greatly exceed three-fourths inch. Increasing the depth tends to produce roughness in the pavement.
4. That cobbling of the brick is greatly increased as the spacing between bricks is increased.
5. That the use of excessive quantities of asphalt filler is a common and serious fault in construction, unnecessarily increasing the cost and resulting in a condition which impairs both the appearance and the serviceability of the pavement.
6. That base construction of other than the rigid type may in many cases prove entirely satisfactory. Macadam bases and those constructed of certain types of natural earth appear to be suitable when the local conditions are such that these types of construction maintain their stability throughout the year.
7. That no difference in the base construction is necessary for the different thicknesses of brick.

Trend of Concrete Pavement Design

The trend of concrete pavement design since 1921 toward the thickened-edge type has been brought out by a tabulation of federal aid projects made recently by the U. S. Bureau of Public Roads. This tabulation shows that prior to 1921 all projects submitted were of the thin edge or uniform thickness design, but since that year the thickened edge section has grown steadily in favor.

The tabulation gives the number of projects submitted by the 48 states during each year from 1917 to 1925 inclusive and classified as to pavement thickness; there being thirty thickness classifications, ranging from 5″ uniform thickness to 12-6-12 (in this and other cases the first and last figures indicate the edges and the middle figure the center of the pavement). The uniform thickness pavements were 5″, 6″, 7″, 7½″, 8″, 9″, 10″ and 12″. Thin-edge pavements range from 5-6-5 to 8-10-8. The thickened-edge pavements range from 7-5-7 to 12-6-12, there being only one instance of the last, this being in 1925.

In 1917 there were 9 projects with uniform thickness and 9 with thin edge. In 1918, 37 uniform and 35 thin. In 1919 there were 123 uniform and 175 thin. In 1920, 191 uniform and 149 thin. In 1921, 161 uniform and 90 thin, with 4 thickened-edge. In 1922 there were 255 uniform and 141 thin, while the number of thickened-edge increased to 22. In 1923 the number of thickened-edge increased 108, while the uniform-thickness had decreased to 162 and the thin-edge to 64. In 1924 the thickened-edge increased to 356 projects while 89 were uniform-thickness and only 25 with thin edge. In 1925 the thickened-edge projects increased to 418, the thin-edge decreased to 9 and the uniform to 96.

The most popular thickness for pavements of uniform thickness was 8″ except in 1923 and 1925, when the 7″ pavement slightly exceeded it. Of the thin-edge pavements the 6-8-6 was considerably more popular than any other up to 1923, when it was exceeded by the 6-7-6, while in 1924 and 1925 the 6-8-6 was the only thin edge pavement adopted on federal projects.

Of the thickened-edge pavements the 9-6-9 has been by far the most popular in every year except 1922, in which for some reason no projects of this dimension were submitted, but the 8-6-8, and the 9-7-9 constituted 80% of the total. In 1925 the numbers of each dimension of thickened edge pavement submitted were as follows: Forty-three 7-6-7; fifteen 7½-5½-7½; seventy-two 8-6-8; four 8-6½-8; thirty-three 8-7-8; one 9-5-9; one hundred and sixty 9-6-9; thirty-four 9-6½-9; forty nine 9-7-9; three 10-7-10; three 10-8-10; one 12-6-12.

Iron Plates for Brazil Pipe Line

In bringing water to Sao Paulo, Brazil, from a lake across the mountains, in addition to tunnels and other forms of conduit there will be about 20 miles of metal pipe 90 inches in diameter. The engineers, Messrs. Braithwaite and Co., of London, decided to use pure iron rather than steel for this pipe, and delivery of material has already begun. About 20,000 tons of iron plates will be required 7/16 and ½-inch thick, 85 to 90 inches wide and 19 to 26 feet long. Armco ingot iron plates are being furnished by the American Rolling Mill Co. through the Armco International Corporation.

New Equipment for Public Works Construction

Brief descriptions of about sixty new appliances, or recent improvements of old ones, including trucks, tractors, trailers; cranes, shovels and other machinery for digging and handling earth and other materials; equipment especially designed for building roads, and for mixing concrete; portable pumps, and miscellaneous appliances.

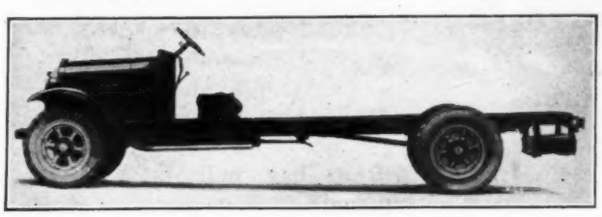
Machinery is rapidly replacing labor in the contracting business, increasingly so as labor becomes more scarce and its wages higher. Every month sees new equipment, or improvements on last year's, offered to contractors. We endeavor to keep our readers informed of these in our department of "New Appliances," describing ten to fifteen in every issue. Recently we wrote to all manufacturers of contracting equipment of whom we knew, asking them to inform us of any new equipment or recent improvements that they had put on the market which we had not yet described. The replies showed what strides the inventing and manufacturing of such equipment are making, and we believe we are rendering a service to contractors and administrators of public works in publishing a brief review of them in one comprehensive summary.

The following descriptions are prepared from material furnished by the manufacturers. In them we have endeavored to give such information as will enable the reader to determine whether the appliance would probably meet his special needs. More complete details will of course be furnished gladly by the manufacturers. Equipment that has already been described in our "New Appliances" department is not included but lists of such are given. That which has been in service a year or more also is omitted—space could not be found for it all.

TRUCKS, TRACTORS AND TRAILERS

New 2-Ton Graham Truck

Two new types of 2-ton chassis are being furnished by Graham Bros., Detroit (a division of Dodge Bros.) with which can be obtained a body to meet almost any requirement. The new truck is made with a wheel base of 137 inches for 9 foot bodies and one of 162 inches for 12 foot bodies. Both are equipped only with pneumatic tires, the rear ones either single or dual. The pressed steel frame side rails for the shorter chassis are 7 inches deep by 3/16 inches and that of the larger 7⅛ inches by 1/4 inch. Both service and hand brakes are of an internal self-aligning type operating in heavy pressed steel drums at the rear hubs. The pedal operates all four bands while the brake lever operates only two.

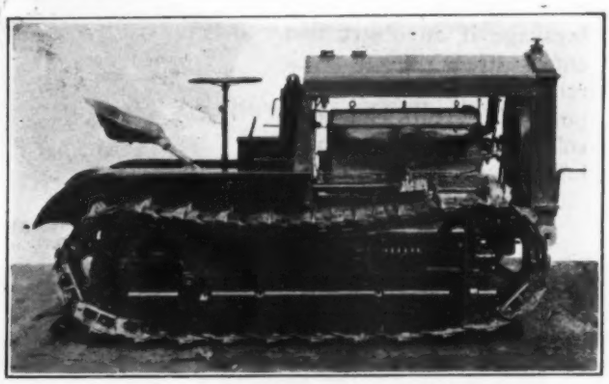


GRAHAM TWO-TON CHASSIS

The power unit consists of the standard Dodge Bros. four cylinder engine.

Recent Cletrac Improvements

The most recent "Cletrac," a tractor constructed by the Cleveland Tractor Co., Cleveland, Ohio, is the Model A 30-45 horsepower. It is built for heavy duty service, especially road work. It has a total tractive surface of 1,800 square inches on the ground. There are only four grease cups on the entire tractor and all of the plain bearing lower track wheels are lubricated by pushing a plunger. The "snap" oiling system is operated while the tractor is in motion.



MODEL A CLETRAC TRACTOR

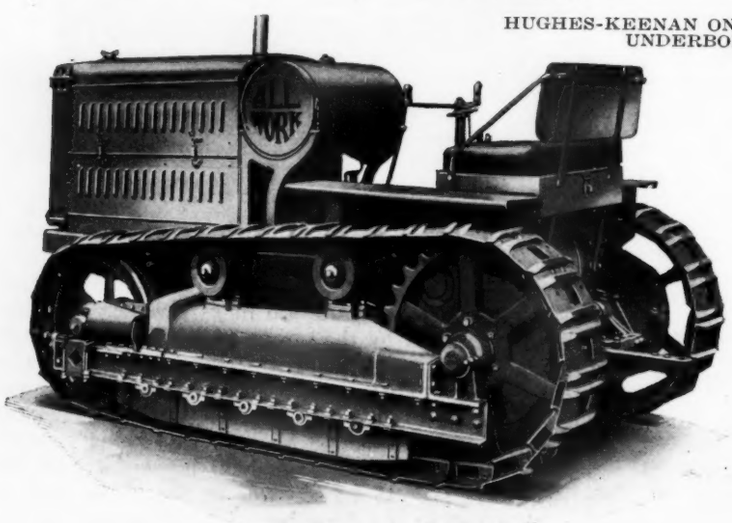
The motor is a six cylinder, four cycle, water cooled, with four-inch bore and five-inch stroke. The transmission is selective type with speeds of 2.5 and 4.75 miles per hour and 1.8 miles reverse. Steering is accomplished by the power of the motor through planetary compensating gears; the turning radius is eleven feet. There are twenty-five manganese steel track shoes 13 in. wide in each track; the length of track on the ground on each side being seventy inches. The tractor is rated 30 horsepower at the draw bar and 45 horsepower at the power pulley, with a pull at the draw bar of 5,700 pounds at 2½ miles an hour and 3,500 pounds at 4.75 miles.

Rotary Skein Dump Wagon

A dump wagon using a rotary skein is manufactured by the Thornhill Wagon Co., Lynchburg, Va. In this wagon the hub revolves on the lubricated skein, the skein also revolving on the spindle. It is claimed that this eliminates danger of skein and axle breaking, increases the durability of the wagon, and reduces the pull of the load. The rotary skein contains two large grease chambers by which both the inside and outside surfaces of the skein are thoroughly lubricated and grease need be applied but once a month. All parts of the wagon are built of the strongest and most suitable material; felloes, hub, and bolsters of white oak, spokes and box cleats of tough hickory, and steel reinforcement on the tongue, bed bottom and other places subject to excessive strain or wear.

Allwork Tractor

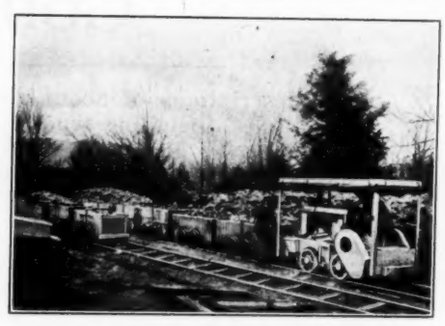
A 5-ton crawler type tractor is made by the Electric Wheel Co., Quincy, Ill., driven by a large 5 1/4 x6 inches heavy-duty, 4-cylinder engine with five main crankshaft bearings, separate cylinders and force feed oiling system through drilled crankshaft. The transmission is oversize to correspond to the engine power and withstand shocks. The control is sensitive; the traction positive. The speeds are 1.95, 2.9 and 4.4 miles per hour direct and 2.6 reverse. Rated horsepower, 25 at drawbar, 35 at belt when pulley is used. Crawlers, 12 inches wide, 77 inches ground contact; large coil springs maintain proper track tension and avoid breakage if an obstruction enters track; five truck rollers on each track supported by Hyatt high duty roller bearings. Alemite lubrication.



"ALLWORK" TRACTOR; ELECTRIC WHEEL CO.

Gasoline Locomotives

A locomotive built around a Fordson tractor and suitable for road construction or other work where portable track is employed, is manufactured by the Brookville Locomotive Co., Brookville, Pa. These locomotives are built for all gauges from 23" to 56½" and have three speeds both forward and reverse without alteration of the Fordson mechanism. The Fordson is used without change except for the wheels and front axle assembly. The frame is composed of 12" 50 lb. ship channel. This carries journal boxes, a dual system of brakes and four sanders. There is a positive drive on all four wheels, the Fordson axles being used as jack shafts for transmitting the power to lower axles. The two standard speed ranges are 2½ miles, 4.8 miles and 12 miles on low, intermediate and high respectively; or 2 miles, 3.6 miles and 9 miles. The wheels are 20" diameter, wheel base 36½". The draw bar pull is 2,000 pounds.



BROOKVILLE LOCOMOTIVE AT WORK

HUGHES-KEENAN ONE-YARD DUMP BODY WITH UNDERBODY HAND HOIST

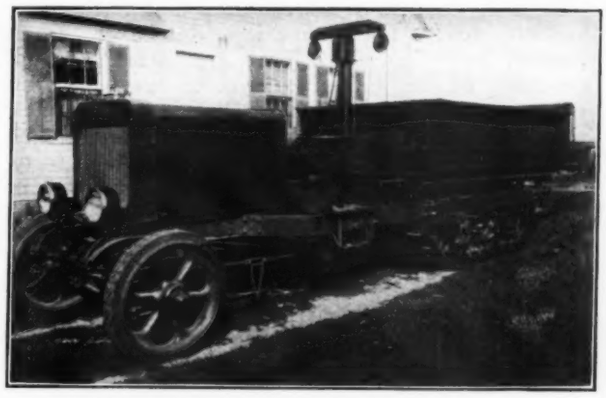
Steel Truck Bodies

Steel truck bodies and hoists especially designed for various purposes and to fit Ford, Chevrolet and Graham Bros. trucks are manufactured by Hughes-Keenan Co., Mansfield, Ohio. These include a 1 yard and 1½ yard gravity body with double-acting tail gate; also a garbage body with a capacity of 50 cubic feet, water measure. Either underbody or vertical hoist is provided. The underbody hoists are built to lift a 2-ton load to a 50 degree angle in ten seconds; while the vertical hoists lift the same load to a maximum angle of 45 degrees in ten seconds. Garbage and wet concrete bodies are built from No. 10 gauge steel plate solidly arc welded to form a watertight container. The sides are heavily reinforced with a double flange. The same material with electrically welded joints is used in most of the bodies manufactured by this company. For a Ford truck with frame extension, the company builds steel dump bodies 60 inches wide, in two lengths, 96 inches and 108 inches, with a capacity of two to three tons; the bodies having low sides, making them convenient for loading.

Expansion Wheels for Tractors

Expansion wheels on which rubber tires, either dual or single, can be mounted anywhere with the use of only a hammer and an ordinary wrench are manufactured by French & Hecht, Davenport, Iowa. With these wheels, it is unnecessary to use power presses to mount or remove tires. The wheel has a steel rim 4½ inches or 8 inches wide, with two openings in same at diametrically opposite positions, each opening being slightly wedge-shaped. In mounting a rubber tire, the rim is driven inside the base of the tire by use of an ordinary hammer and wooden block. Expanding wedge devices are then placed in each of the two openings in the rim and the wedges are driven together, thus expanding the rim of the tire and causing a tight fit. The wheel consists of this rim and steel spokes which are forged into the hub, the whole weighing approximately 220 pounds with a 4½ inch rim, or 270 pounds with an 8 inch rim. Where additional weight of steel is desired, weights can be attached to the wheels weighing from 100 pounds to 1,000 pounds each.

MOUNTING TIRE ON EXPANSION WHEEL



LOMBARD TRUCK AT BELLOWS FALLS

Lombard Tractors

A new machine has just been brought out by James S. Barron, New York, distributor of Lombard products. This found its first use on a hydo-electric job of the Sherman Power and Construction Co., at Bellows Falls, Vt. The machines are 75 horse power where it is not desired to haul trailers, but for trailers or long hauls 100 and 125 horse power are furnished. In the machine shown in the illustration the body is of 6 yards capacity and is designed to carry a load up to 20 tons on its own body for handling heavy materials like granite blocks, etc.

Horizontal Mechanical Truck Hoist

A horizontal mechanical hoist operating on the worm and spur gear principle is manufactured by the Van Dorn Iron Works Co., Cleveland, Ohio. This is an underbody hoist in which the power developed by the motor is transmitted by a series of worm and spur gears in a 350 to 1 ratio for dumping the load. A roller chain connects the power take-off of the truck to the hoist. A hand lever reached from the driver's seat controls the hoist, which can be stopped at, locked or lowered from any dumping angle up to 45 degrees. The hoist is built in two sizes, a light-duty for 1-ton to 3-ton trucks and a heavy-duty for 3½ to 9 tons. The company also makes vertical mechanical hoists for trucks, and steel dump truck bodies.

Steam Chassis

A chassis using as a power unit a Rotobaker rotary steam engine, steam generator, oil burner and automatic controls, is manufactured by the Steam Appliance Corporation of America, Cleveland, Ohio. The manufacturers claim for this extreme long life, elimination of customary service costs, economy of operation, direct non-intermittent ac-

celeration, freedom from vibration and from combustion fumes. The engine is a Rotobaker Steam Engine, 5-cylinder, 4½" bore, 3½" stroke; steam generator of the water tube type enclosed in pressure type insulation case. The burner operates with distillate, fuel oil, torch oil, kerosene or any fuel to as low as 28 Beaume. Tanks hold forty gallons of oil and thirty gallons of water. It is claimed that one gallon of oil will give as much mileage as other buses with a gallon of gasoline.

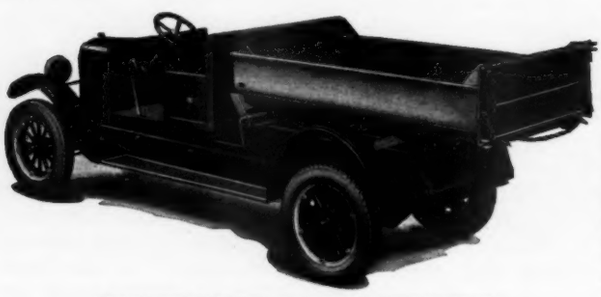
Drop Frame Trailers

Drop frame trailers, made especially for transporting steam shovels or other heavy machinery more rapidly than can be done by their own power, are manufactured by the Warner Manufacturing Co., Beloit, Wis. These are made in the form of semi-trailers, four-wheel or six-wheel types and both rear loading and side loading. By means of the drop frame the loading edge is brought to 13½ inches to 25 inches from the ground, which permits loading any machine and insures stability of load. Rear loading trailers of 35-ton capacity or over are provided with two axles at the rear, distributing the impact over a greater surface.

On one type, good for loads up to 60 tons, springs are used to support the load at the rear, and Warner hydraulic brakes are provided. There are 7 longitudinal frame members and four cross members tying them together. Another type of trailer has 4 wheels in line at the rear and is side loading and especially adapted for transporting power shovels. The four wheels at the rear are mounted on 2 axles, permitting the wheels to conform to the crown of the road and keep the unit level. All trailers are provided with double cam, all-metal brakes with removeable steel liners in the shoe and drum. L

Steel Dump Bodies

Steel dump bodies, both gravity and hoist, are sold by the Martin-Parry Corporation, York, Pa. One line, for use with the Ford chassis, is 72" long, 50" wide with 15" height of side and a capacity of 31 cu. ft. The gravity dump body has an appropriate weight of 750 lbs. and the hoist body a weight of 710 lbs. The capacity can be increased 12½ cu. ft. by adding 6" side pieces, while by using flared sides 25 cubic feet increased capacity is possible. A heavy-duty body is furnished for the improved Chevrolet in which, in the hoist body, more than 60 percent of the carrying capacity is in front of the rear axle, the body rolling back over the rear wheels when dumping. Three and one-half turns of the crank effect a full dumping angle. This body is 84 x 48 x 12" with 29 cu. ft. capacity water level. The gravity dump body is full automatic using a jack knife arm; the body being automatically locked at full dumping angle until the driver desires it to return. Both dumping and return actions are effected by a lever inside the cab, so that the driver need not leave his seat.



MARTIN-PARRY STEEL DUMP BODY

Krohn Kompensator for Trucks

A contrivance which is said to compensate for difference in rotative speed as well as in tractive ability between the driving wheels and delivers the power of the engine to each wheel in proportion to its ability to use it in propelling the truck, is manufactured by H. McFarlane & Co., Chicago, Ill. under the name of Krohn Kompensator. It can be installed on a Ford truck, going into the space of the ordinary differential without altering any part of the truck. When differential action takes place, the external gear on one axle shaft and the internal gear on the other axle shaft turn in opposite directions, which induces a rapid swinging motion to the central driving plate. The ratio of this swinging motion depends upon the difference in the number of teeth on the two intermeshing gear sets and may vary between wide limits of 12 to 1 or 20 to 1, according to the amount of differential resistance desired. The contrivance compensates for the difference in rotative speed between the driving wheels when turning corners or when there is any difference in tire diameters; also for difference in tractive ability, as when one of the wheels is on a slippery surface.

Hydraulic Truck Hoists

"St. Paul" vertical and underbody hydraulic hoists are manufactured by the Hydraulic Hoist Manufacturing Co., St. Paul, for light, medium and heavy duty; the light-duty vertical being for trucks having a rated capacity of 3 tons or less, and heavy-duty for those of 3½ tons or more; while the light-duty underbody is for trucks of ¾ to 1½ tons capacity and the medium for 3 tons or less, and a heavy-duty underbody is made for trucks of 3½ tons or more. In the vertical hoist the light-duty has a hydraulic cylinder 5" diameter with a maximum lifting strength of 6 tons, and the heavy-duty a 6" cylinder with 15 tons lifting strength, 2 to 3 h. p. being required for the former and 3 to 4 h. p. for the latter. An extra heavy vertical is made, using an 8" cylinder and tested for 30 tons maximum capacity, recommended for trucks having a rated capacity of 7½ tons or more. Power take-offs are supplied with each hoist for any of the principal makes and models of motor trucks.

Dump Trailers

A trailer called by the makers the "Little Red Dump Trailer," is furnished by the Little Red Wagon Manufacturing Co., Omaha, Neb., especially for use with Fordsons. It is claimed that this trailer will carry twice as much in a day as a dump wagon with three horses. The trailer is joined to a Fordson by means of a forged goose-neck which fits solidly to the body of the trailer without springs and is attached to the Fordson by means of a ball and socket joined in place of the regular Fordson drawbar cap. In model A for dirt work the chains go through the sides and the doors hang inside the box. In model B the chains run under the doors, leaving the bed of the wagon free, which is an advantage in steam shovel work and in hauling asphalt, ashes or where a sand-tight box is desired.

The following have been described in the "New Appliances" section of PUBLIC WORKS this year.

New White truck, Model 52D; The White Company, Cleveland, Ohio, January.

"Big Brute" truck; General Motors Truck Co., Pontiac, Mich., February.

Cab for motor trucks; Highland Body Mfg. Co., Cincinnati, O.; also the Metropolitan Body Co., Bridgeport, Conn., February.

Bus chassis; The White Company, Cleveland, O., June.

Ash and garbage truck body; Atia Corporation, New York City, June.

Transmission for Ford trucks; Fuller & Sons Mfg. Co., Kalamazoo, Mich., July.

MOVING EARTH AND OTHER MATERIALS

The Du-Pat Scraper

Claims made for the H. P. Du-Pat scraper by the manufacturers, the Hadfield-Penfield Steel Co., Bucyrus, Ohio, are that it scoops up a full load

THREE DU-PAT SCRAPERS OPERATED BY ONE TRACTOR

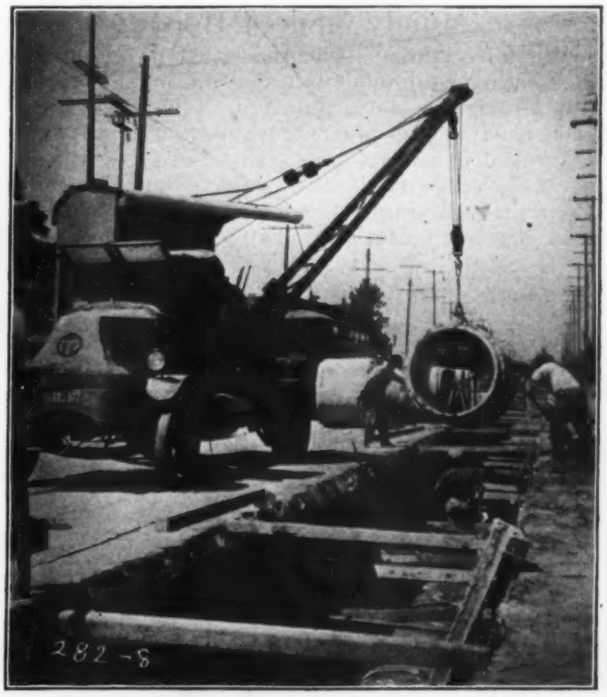
either instantly or gradually at will, dumps the load instantly or spreads it evenly, loses no dirt in traveling, is light in draft and simple in operation, and loads and unloads from the operator's seat. The scraper is hung so high that the machine may be driven over an embankment without catching the blade; when driving down a steep bank the scoop is hung in such a position that the rounded back part strikes the bank and slides down, preventing any shock on the wheels. The apron or end gate is of the clamshell action and closes automatically at the end of the loading operation, preventing loss of dirt. The scoop can unload while going down grade as well as upgrade. Tandem hitch and clutch control make it possible to connect and operate two or more scrapers behind a single tractor. It is built in several sizes, one yard and 2½ yards being the most common. The illustration shows work on the High School stadium at Akron, Ohio, in which three Du-Pats were hitched to a tractor and moved 1,800 to 2,000 yards every 24 hours, hauling the dirt 1,500 feet.

Universal Cranes

The latest development in the cranes manufactured by the Universal Crane Company, Cleveland, Ohio, are 6 and 7½-ton models, which are the first changes made in Universals for a considerable period. These cranes are rated at 12,000 pounds and 15,000 pounds, respectively, at 10-foot radius. Their appearance and size are the same as the present 5-ton crane, to which they are similar in practically all respects except their greater reach and capacity. Several have been in service by contractors and tested by them for six months or more before they were offered to the construction field. They are full revolving with a swing speed of 6 revolutions per minute and rope speed of 140 feet per minute. The power is a 44-horsepower Waukesha gasoline motor. They are one-man operated, being controlled by three levers and one foot pedal. They are used for either clam-shell or dragline operation and are suitable for mounting on motor truck, crawler, trailer, etc.

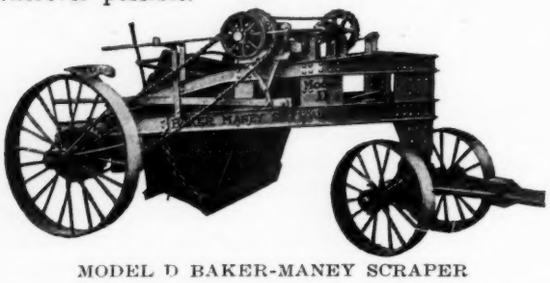
Baker-Maney Tractor Scrapers

Developing the original Maney scrapers through successive stages for use in train formation behind tractors, the Baker Manufacturing Co., Springfield,



UNIVERSAL CRANE LOWERING SEWER PIPE

Ill., has produced the Model D 1¼-yard Baker-Maney scraper, applying the original principle through a change in construction which better adapts them to the strains caused by loading and unloading in train formation. The highest grade of steel and other materials are used and the maker believes the cost of repairs will not exceed one-fourth of those on previous models. Renewable wearing parts are used wherever possible.



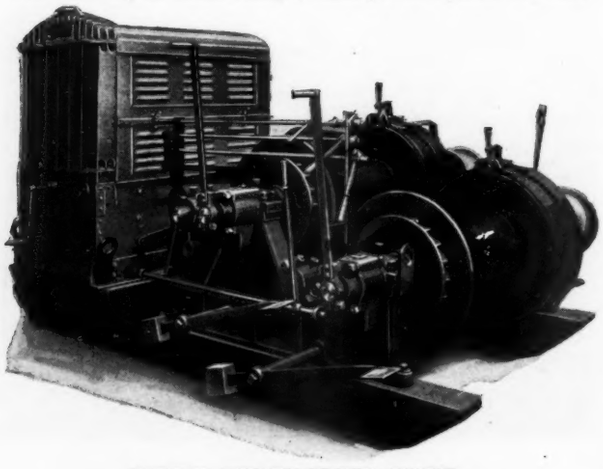
MODEL D BAKER-MANEY SCRAPER

One man besides the tractor operator will load a 3-scraper train, with an extra man when 4 to 6 scrapers are used, and one man dumps. The same men can load and unload two trains. The tongue of the Model D is set much lower than in previous models, holding the scraper well in the ground when loading; and the frame construction is changed considerably, eliminating the goose-neck formed in front by the side frames and substituting a cast steel bolster and tongue. The new frame consists of two steel channels on each side heavily braced and gusseted.

A tractor of 20 to 25 horsepower at the draw bar will load and haul three or four of these scrapers and a 40 horsepower, six of them, without plowing if the soil is good. A train can be turned in a width of twenty feet without overturning or binding.

Mundy 3-Speed Hoist

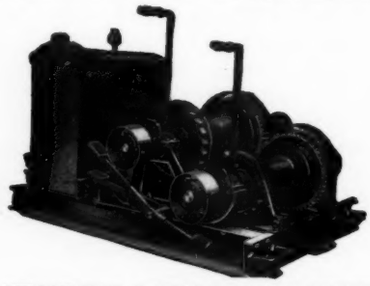
What is claimed to be the latest development in hoisting equipment is a 3-speed hoist sold by the Mundy Sales Corporation, New York City. It uses a sliding gear transmission similar to that used in automobiles. This hoist is built to handle average loads at more economical speeds than the old single-speed hoist. Whenever the load changes materially, change in speed or line pull can be made in 10 seconds. This is accomplished by moving the gear shift lever rather than changing the reaving in the derrick. This hoist will handle a concrete power bucket at 310 feet per minute, and by changing gear the sliding frame and chuting equipment can be moved to the next floor at 140 feet per minute. The electric hoist is built complete with G. E. motors, controllers, and resisters and is made in eight standard sizes ranging from 20 h. p. to 100 h. p. The gasoline hoists are equipped with Waukesha 4-cylinder power units in seven sizes from 20 to 75 h. p. All are equipped with automatic safety brakes.



MUNDY THREE-SPEED HOIST

Hoists for Derrick Work, Pile Driving and Dragline Jobs

The Construction Machinery Company, Waterloo, Iowa, furnishes a double drum hoist known as the "Wonder" in three sizes, using 8 horsepower, 9 horsepower and 10 to 15 horsepower, respectively.



"WONDER" DOUBLE-DRUM HOIST

The bed frame is of the box type, of heavy structural steel, with a substantial eye bolt at each corner for anchorage. The drums are of cone or V friction type, fitted with long bronze bushings and equipped with heavy ratchets. The drums run loose on their shafts, engagement with which is made by means of a helix thrust, forcing the drum along the shaft and engaging the friction surfaces. Transmission of power is by means of sprocket and chain drive direct from Fuller & Johnson single cylinder horizontal engine, except the larger size which uses a four-cylinder Le Roi 10 to 15 horsepower unit.

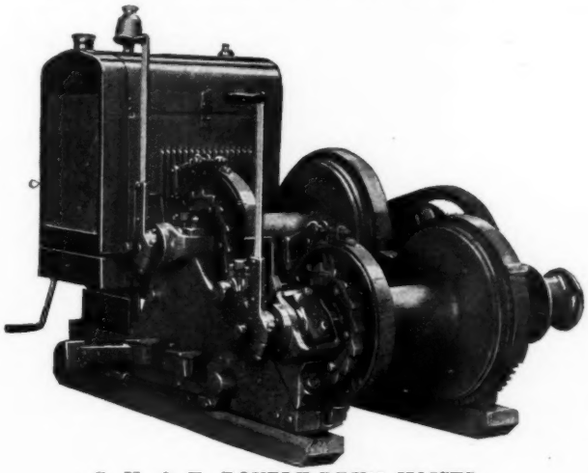
Tower Hoists

Steel tower hoists for tower distribution of concrete are built in three sizes by the Archer Iron Works, Chicago, Ill. These have bucket capacity of 9 cu. ft., 18.4 cu. ft. and 25 cu. ft. of mixed concrete respectively. These hoists consist of two sizes of steel mast section, one 19½ inches by 15 inches, outside dimensions, the other measuring 25 inches by 21 inches; the former used for the 9 cu. ft. capacity and towers not exceeding 160 feet high, guy supported; the heavier sections used for the two large capacities and towers 240′ guy supported. Both can be furnished of any height if fastened to a building or other support. The masts are furnished in 20 foot lengths. Cross arm brackets of heavy 1-beam construction are furnished for bolting to the mast at 40 ft. intervals. The

buckets are provided with a bale which travels up and down one face of the mast and is so arranged that if the bucket is raised too high it will empty its contents into the hopper and automatically right itself when lowered. Where the hopper is used with a boom spout it is mounted on a sliding frame so as to move up or down the tower with the spout.

C. H. & E. Hoists

Single-acting, reversible and double-drum hoists are manufactured by the C. H. & E. Manufacturing Co., Milwaukee, Wis. They are operated by Le Roi and Waukesha engines and will lift 3500 lbs. at 175 feet per minute with a single line, or 1500 lbs. at 400 feet per minute on sheave. The drum holds 1600 feet of ½" cable



C. H. & E. DOUBLE-DRUM HOISTS.

in the single-acting or double-drum and 1000 feet in the reversible. Silent chain drive is used, the chain and gears being covered by a guard. Friction clutches are of the double cone type.

Self Loading Scraper

The Beach Manufacturing Co., Charlotte, Mich., manufactures a scraper which is constructed of 10-gauge steel with the top and sides flanged and the cutting bit a curved, high-carbon blade. The handles also are steel. An adjustable shoe on the back can be set to give the scraper any desired pitch. The width is 48 inches, height 23 inches, and weight 100 pounds.

Western Tumblebug

A new earth handling machine for long hauls is called the "Tumblebug" by its maker, the Western Wheeled Scraper Co., Aurora, Ill. It is said to be built on entirely new principles, to provide a scraper of large capacity for use in hauls too long for Fresnos and too short for dump wagons. The tumblebug, though weighing only 1,300 pounds, has a capacity of one cubic yard. One man can load or unload easily with one hand and ride the scraper at all times; or can operate a train of scrapers.

The operation of the pan is controlled by a lever, which is locked when transporting material. When the lever is pulled up the pan tips forward to receive material and the cutting edge, which is entirely separate from the pan, take the position for cutting into the earth and, when the lever is locked at neutral, acts as an end gate to prevent spilling of material. To dump, the lever is pushed downward, the cutting edge moves up and the pan revolves like a Fresno, but rolls entirely over. Two horses can pull a scraper and unload, with four more as a snatch team for loading. The cutting edge is 5 feet long and cuts beyond the wheel on each side so the wheels ride on a smooth surface. All working parts are of steel.

Perry Automatic Scraper

A one-man tractor scraper is manufactured by the Perry Co., Sidney, Ohio, which the tractor driver can control by means of a lever, varying the depth of cut and dumping in a heap or spreading to grade as desired, all without stopping or backing. The manufacturer claims that for any length of haul up to 800 feet and for volumes of earth not large enough to justify steam shovels and trucks, these scrapers will move earth at a lower cost per cubic yard than any other type of equipment.

New Bucyrus Shovels

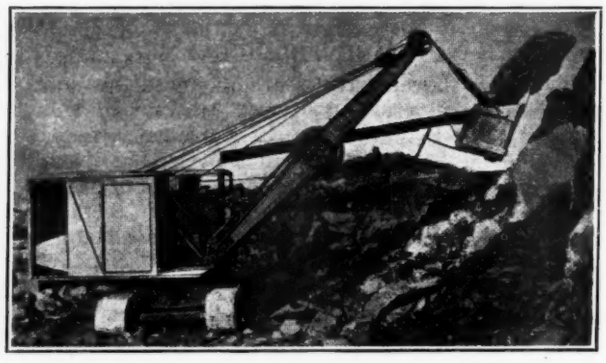
Two new shovels have been announced this summer by the Bucyrus Co., South Milwaukee, Wis., known as 31-B and 41-B. The former is a one-yard and the latter a 1¼-yard shovel. The overall dimensions of the 1-yard shovel are no greater than those of most ¾-yard and it can therefore manoeuvre in odd corners and work to advantage in narrow cuts. The rear end radius is 9′ 6″. It is built to cut a level floor 16′ 7″, dig 4′ 11″ below grade and dump 12′ 6″ above the floor level. It retains all the Bucyrus features, including outside dipper handle, boxed girder boom, two-part-hoist direct connected to dipper, unobstructed dipper opening, swing engine mounted in front, and Bucyrus caterpillars, with no gaps between links. When using a ⅞-yard dipper it can reach an extreme dumping height of 21′ 7″. It is easily convertible into a drag line with a 40′ boom; also can be used as clamshell or crane.

The 41-B is a companion machine to the 31-B except for larger capacities and working ranges, being midway between the 31-B one-yard and 50-B, 1¾-yard.

BUCYRUS 31B ONE-YARD SHOVEL

The Lorain 75 Shovel

A combined shovel, crane and dragline called the Lorain 75 by its maker, The Thew Shovel Company, Lorain, Ohio, is now offered to contractors. It is designed as a 20-ton crane, which is more than the power required for a 1¼ yard machine, but it occupies the space of the average ¾-yard crane. The maker claims unprecedentedly smooth positive control with instant response. Three power shafts are driven by one pinion, each shaft and its mechanism being a complete unit. New position of the shipper shaft in the boom permits a given length of boom and stick to dump higher and dig further than any heretofore designed. The machine is designed throughout for service as both shovel and crane. One hand lever and a foot brake control the main hoist drum; a second hand lever controls the two swing clutches which rotate the turntable in opposite directions; and a third hand lever controls, through two clutches, a two-speed reversing shaft which operates the travel, boom hoist and dipper crowd motions. These several motions can be operated independently or in combination.



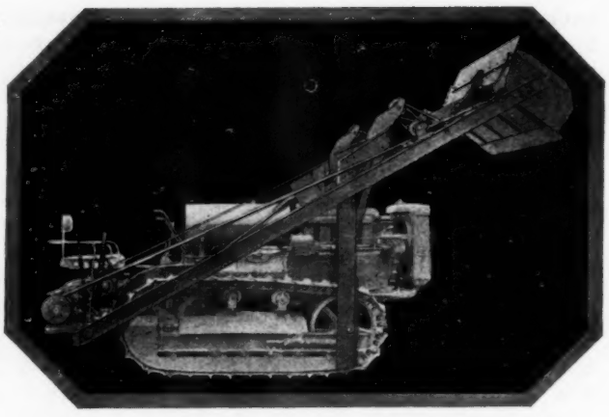
LORAIN 75, A 20-TON CRANE AND SHOVEL

As a shovel, with a 21-foot boom and an 18-foot stick, it will clear 24 feet 2 inches with an open 1¼-yard dipper; or it has a 30-foot 4-inch dumping reach for side casting.

The gasoline power unit is a four-cylinder, heavy duty engine guaranteed to develop 81 horsepower at 850 RPM; or it may use an electric motor of 40 to 50 horsepower. As a hoist it will exert a pull of 15,500 pounds at 160 feet per minute, and as a dragline, 20,500 pounds at a 120 feet per minute.

Loader Attachment for Tractors

A loader which is designed to be used as an attachment to Caterpillar or Fordson tractors, is manufactured by the Killefer Manufacturing Co., Huntington Park, Calif. That designed for the Caterpillar can be removed by pulling four pins when the tractor can run out of the loader frame. The attachment can be supplied for the 30 h.p. or the five-ton model. The bowl used is five feet wide and holds five-eighths of a yard and is of the Fresno scraper type built of quarter-inch material. A heavy power shaft is mounted on ball bearings on the draw bar and winding drums are mounted close to the bearings. This shaft also carries the overrunning brake and lifting clutch. Power is delivered to it from the



KILLEFER LOADER ATTACHMENT

power takeoff by a heavy roller chain. The frame is made of heavy structural steel, as are the uprights which guide its travel. The entire attachment weighs 3,300 pounds. The attachment for the Fordson uses a one-third yard bowl 40 inches wide, although a 48-inch bowl may be had. The bowl will cut 10 inches below grade.

Mead-Morrison Halfyard Crawler

A new half-yard crawler is offered by the Mead-Morrison Manufacturing Co., Boston, with which are furnished attachments permitting it to serve as shovel, ditcher, clamshell, drag line, skimmer and crane. The special features mentioned are full circle swing, easy convertibility, one-man operation, simplified control, live boom and powerful cable crowd. It has automatic service brakes which hold the load automatically, giving complete control of the drum with one lever only, enabling the operator to crowd his machine all day with minimum fatigue, and with no slowing up while applying brakes nor time lost in dogging the upper drum to hold the line boom.

MEAD-MORRISON HALF-YARD CRAWLER

Squier-Rix Cranes

A portable hoisting unit for handling sewer and water pipe as well as other purposes is offered to municipalities by the Squier-Rix Company, Milwaukee, Wis., as the Rix-Fordson Hoist. Where cities already own tractors the investment in the hoisting attachment is small, as the crane fits on a Fordson tractor without in any way altering the mechanical construction of same. The frame and boom structure is rigid bridge construction to take care of stresses which occur when moving suspended loads.

RIX HOIST HANDLING PIPE SPECIAL

A ballast box in the rear frame loaded with sufficient pig iron or other ballast relieves the load pressure on the front wheels and also increases the draw bar pull of the Fordson. Power is applied for both hoisting and lowering by means of a multiple disc clutch. Transmission consists of two disc clutches with gears, worm gear and drum mounted on a solid base. The hoisting unit is designed and built for a working load of two tons.

Special attention is given to safety. There is an automatic load brake that engages load instantly when either clutch is released, and a limit switch automatically throws control lever into neutral when load reaches maximum height.

Otis Swing Crane

A full circle swing crane rigidly and substantially mounted on a Fordson tractor is offered by the Otis Engine Corporation, New York City. A 1-ton load can be lifted and swung in a circle up to 18 feet diameter. The counter-balanced boom is normally 15 feet from the ground, but can be raised to 18 feet or lowered to 10 feet. While suspended from the boom a load may be carried at the rate of 6 miles per hour. The hoist attached to the side of the tractor has all its controls through friction clutches and friction brakes within easy reach of the operator. When desired, a lift truck platform is placed at the rear of the tractor to handle 1-ton loads that pile well but are not suitable for a sling.

Trench Back-Filler

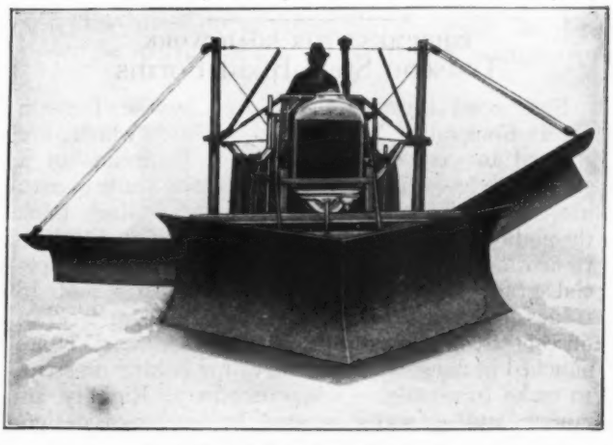
A trench back-filler attached to a Fordson tractor and operated solely from the driver's seat, is offered by the Otis Engine Corporation, New York City. It consists of a counter-balanced boom automatically raised and lowered, on which is mounted a travelling carriage carrying a reversible scraper blade and operated by a reversible hoist on the side of the tractor. The boom, 15 feet long, may be operated at any angle above or below the horizontal. The travelling carriage travels along the boom on eight rollers and is connected by cable to the hoist. The length of its stroke in either direction is controlled by the tractor operator through friction clutches. The scraper blade is 6x1½ feet and can be set so as to either pull the dirt toward the tractor or push it from it. It can be moved from 1 to 14 feet in either direction at the rate of 6 to 8 strokes per minute, the pulling line speed being 120 to 180 feet per minute and the outhaul line speed being 200 to 300 feet per minute. All wearing parts are on ball bearings working in a bath of oil.

New Novo Hoist

What is claimed to be the most recent development in light-duty gasoline and electric driven hoists is offered by the Novo Engine Co., Lansing, Mich., in the Model N H. This is a single free drum type; double cone, hard maple friction operated by high carbon thrust screw; drum 8″ diameter by 14″ long, (one 12″ diameter furnished if ordered) is bronze bushed; cable capacities of 8″ drum, 1250 ft. of ⅜ in. or 700 ft. of ½ in. cable. Power, Novo 3, 4 or 6 horsepower single-cylinder engine; or 3, 5 or 7½ horsepower electric motor. Capacities, 600 to 1600 pounds. This is the first hoist to use a non-warping, welded tubular frame. Several features have heretofore been found only in a heavy-duty hoist.

New Snow Plow

A new snow plow attachment designed to provide a light but powerful snow handler more practical and efficient than the truck plow and less cumbersome and expensive than the heavy tractor equipment is being offered by the Acme Road Machinery Co., Frankfort, New York. This attachment combines a powerful and light tractor with a rigid steel frame to which the snow moving elements are attached. An independent rear axle mounted on Hyatt roller bearings and geared to the power unit at a ratio of three to one permits the use of large diameter wheels and a locking device by which both drive wheels may



NEW ACME SNOW PLOW

be locked to the rear axle for a combined pull when desired.

The equipment has side adjustable wings which roll and carry the snow over to the sides and also cut down the height of the sides to permit piling additional snow and lessen drifting. This can be adjusted so that the snow is rolled to either or both sides. A low center of gravity is maintained and the weight is divided between the front and the rear to secure maximum traction and positive steering. Attenton is called to the rolling action of the snow instead of pushing and sliding, the adaptability of the snow blades to various road conditions and depth of snow. It is said that the rolling action reduces materially the power required to move the snow over that necessary for pushing and sliding. A scarifier in the rear can be used to break up ice or compacted snow.

The following have been described in the "New Appliances" section of PUBLIC WORKS this year.

Power Shovels—The Erie Steam Shovel Co., Erie, Pa., and The Bucyrus Co., South Milwaukee, Wis., January. The Bay City Dredge Works, Bay City, Mich.; Northwest Engineering Co., Chicago, Ill., August.

Ditchers—The Parsons Co., Newton, Ia., February. Speeder Machinery Corporation, Fairfield, Ia., May.

Backfillers—Buckeye Traction Ditcher Co., Findlay, O., February. The Full-Crawler Co., Milwaukee, Wis., July. Baker Steel & Machinery Co., Omaha, Neb., and Waterman Corporation, Detroit, Mich., September.

Cranes—Northwest Engineering Co., Chicago, Ill., May. Thaleg & Hock, Chicago, Ill., July.

Portable Conveyors—Link Belt Co., Chicago, Ill., May. Barber-Greene Co., Aurora, Ill., and Chicago Automatic Conveyor Co., June. Jeffrey Mfg. Co., Columbus, O., September.

Hoists—Willamette Iron & Steel Works, Portland, Ore., June.

Snow Plow—Walter Motor Truck Co., Long Island City, N. Y., January. Hadfield-Penfield Steel Co., Bucyrus, O.

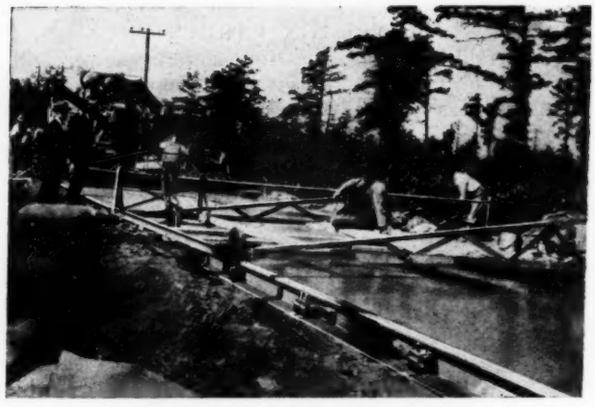
Snow Loader—Fox Rotary Snow Broom Co., July.

Snow Fence—Illinois Wire & Mfg. Co., Joliet, Ill., February.

EQUIPMENT FOR ROAD WORK

Truscon Steel Road Forms

Steel road forms are produced by the Truscon Steel Company, Youngstown, Ohio, which are claimed to give perfect alignment by means of a sliding wedge connection. Other special features are: use of new billet open hearth steel 3/16-inch thick throughout. Top flange 2 inches wide with 1½-inch return, bottom flange 6 inches wide. Stakes of special grade hard steel ⅞ inches diameter and 18 inches long, spaced 1½ inches from ends and 5 feet on centers, held rigidly by three-point contact. Holes punched in flanges 3 feet centers for bolting on strips to make forms higher when necessary. Rigidity, accuracy and economy secured by improved design, simple installation and perfect alignment.



TRUSCON STEEL ROAD FORMS

Forms are in 10-foot lengths, and 6, 7, 8 and 9 inches high.

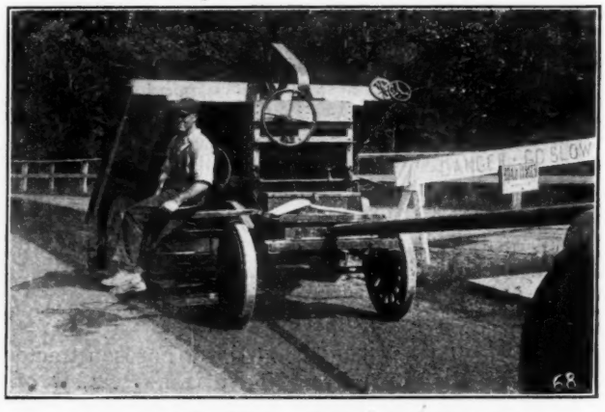
Brick Tongs

Brick tongs adjustable for carrying 7 to 11 bricks at a time are furnished by the Adams Company, Dubuque, Ia. The grips are 2½ inches long and 2½ inches wide and have six adjustments between 15½ and 25 inches apart. The tongs weigh 4¾ pounds.

Chip and Sand Spreader

The latest road machinery offered by the Universal Road Machinery Co., Kingston, N. Y., is the Reliance Chip and Sand Spreader. It is in the nature of a special trailer fitted with rubber tires, roller bearings and springs, and provided at the discharge end of the body with a vaned roller or feeder which delivers a uniform amount of material to the road, the rate being controlled by raising or lowering of tail gate.

It is designed for covering any oiled surface and is especially adapted for resurfacing work or bituminous or asphaltic highways. The unit can be pushed by tractor, truck or roller, and is steered through the large or rear wheels, which become the forward wheels when spreading. It spreads to a width of 8 feet. The body is 8 feet long, 8 feet wide and 52" high with a capacity of 3 tons level full.



RELIANCE CHIP AND SAND SPREADER

New H & B Asphalt Mixer

A twenty-four foot asphalt mixer has just been placed on the market by Hetherington & Berner, Indianapolis, Indiana, which has a capacity of about 2,800 pounds per batch of surface mixture or 2,500 pounds of coarse stone mixture. A new feature is one permitting operating the gate cylinder either by steam or hydraulically, or by compressed air if no steam is available. When operated with steam hydraulically, hot water forms the hydraulic medium, accumulating by condensation of the steam introduced into the jacket space above the cylinder. Any excess condensation over an amount slightly exceeding the displacement of the cylinder on each side of the piston, discharges through the exhaust port into the atmosphere. This system, therefore, gives the combined advantages of a hot mixer bottom and the smooth, powerful operation of the hydraulic cylinder.

For the usual hot-mix plant, handling only surface mixtures or binder course mixtures, a 60 horsepower motor is recommended, but if to be used for mixtures with coarser stone, such as black base, a 75 horsepower motor is advisable and this larger motor is also recommended for making cold or semi-cold mixtures such as emulsified asphalt or amiesite.

The mixer contains the standard features of those produced by this company for many years past.

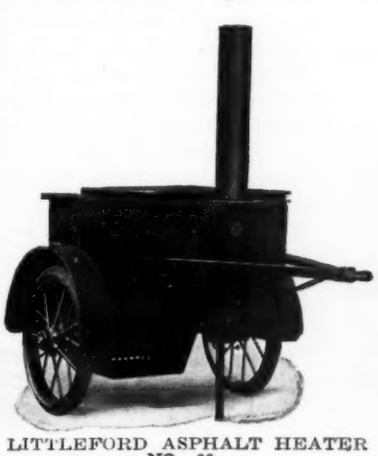
Bitumen Heater and Sand Drier

Improvements have recently been made in their tar and asphalt heaters by Littleford Bros., Cincinnati, Ohio, the more important of which are as follows: The oil burning melting kettle No. 84-W is equipped with a new type of pressure pump for the fuel tank, this pump being submerged in the tank with only the operating handle projecting, thus eliminating all outside piping and danger of leaky joints. The company has developed and is manufacturing a new oil burner for this kettle which is claimed to reduce oil consumption twenty per cent.

Both this heater and the No. 69 coal and wood burning heater are provided with spring cushioned axles and roller bearing wheels, permitting trailing the heater behind trucks at high speed. All rubber tired equipment is now provided with steel heat guards.

Hand spray attachment makes it possible to do penetration work on small patches and reconstruction jobs, this being adjustable to all sizes and makes of heaters. This attachment has recently been provided with a new type of highly insulated metal hose and all steel cut gears.

The company has also recently placed on the market a new rotary sand heater for bituminous grouting and mastic paving work. This is a small, portable, low priced machine, embodying several new principles. It consists primarily of a sheet metal cylinder completely encased, revolving in a flame produced in a large fire box immediately below and at one end. This cylinder is driven at approximately twenty-four revolutions per minute. It is open at one end only and the material is loaded and discharged at this end, being shifted from one end of the cylinder to the other by baffles and spirally wound blades. The sand is charged through a pivoted spout which slopes inward until the sand has been heated, when it is reversed and discharges the sand. Under average working conditions this heater has a capacity of about 3 tons per hour. The cylinder is driven by a 5-8 horsepower gasoline engine, protected by housing against the weather.



LITTLEFORD ASPHALT HEATER NO. 69

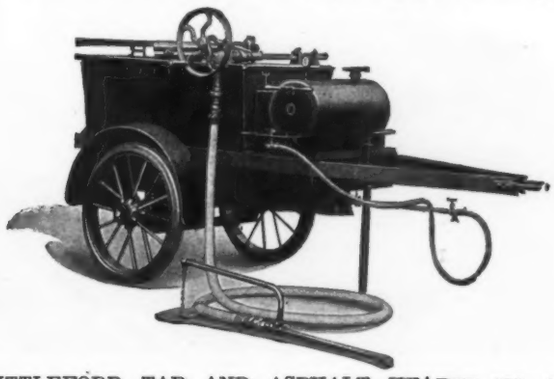
Oil Burning Asphalt Kettles

A kettle for heating asphalt and designed exclusively for the use of oil as fuel has been developed by Connery & Co., Philadelphia, Pa. The latest type is known as style "J." The inside tank is so constructed that hot and cold materials are kept separate, the cold running into the hot reservoir as soon as it melts, carrying with it all sediment and leaving the hot surface clean and in direct contact with the cold material. This makes it possible to add cold material without lowering the temperature of the heated material. The hot material is ready approximately ten minutes after burning has been started and continuously after that. Temperature control with consequent low fuel cost is claimed as a special feature of this kettle. The kettle is mounted on two roller bearing wheels and provided with springs. A distributing tube built into the unit is designed to prevent the inside tank from burning out. A special oil heater is furnished which can be removed for thawing in Winter or for other purposes.

Asphalt Block Press

A press for manufacturing asphalt blocks has been placed on the market by the National Moulding Press Corporation which, in selling the press, gives all the information necessary for manufacturing blocks, gives the purchaser an exclusive territory, and asks no royalty.

The machine is comparatively small, so that it can be installed easily in any paving plant, occupy-



LITTLEFORD TAR AND ASPHALT HEATER NO. 84

ing a floor space of 6x13 feet, with a height of 8 feet above floor level, and weighing about 14 tons. Three standard sizes of blocks can be made on one press, namely 5x12x2, 5x12x2½ and 5x12x3. The average capacity is said to be about 1,000 blocks per hour. About 35 horse power is required to operate it, either direct or belt drive being used. Uniformity in the blocks is assured by automatic regulators of the amount of material fed to the hopper and of the pressure applied. After the hot mixture has been fed to the hopper it is not touched again until the blocks are discharged from the water trough connected to the machine, where they are cooled sufficiently for storage or shipment.

Bituminous Crack Filler

The Harding Crack Filler manufactured by the Beach Manufacturing Co., Charlotte, Mich., is a funnel shaped receptacle made from galvanized steel with a handle on top and the lower end fitted with a brass nozzle through which the bitumen flows into the crack. The nozzle is provided with a valve which can be opened or closed instantly, and can be unscrewed from the holder for cleaning if it becomes clogged.

Lakewood Finishing Machine

The latest finisher brought out by the Lakewood Engineering Co., Cleveland, Ohio is that known as "type C" which combines the function of screed and tamper. At the front of the machine is an all steel strike-off, or screed, 12" wide on the bottom and adjustable for crown, which spreads and surfaces the concrete. This is driven at 35 to 40 strokes per minute with a lateral motion of 5 to 7 inches. The crown may be varied by a simple screw adjustment.

The tamper consists of a wooden beam extending the full width of the road hung on springs from each side of the machine and shod on the bottom with a steel strip. It is given a quick, snappy down and up motion, the force of the blow being adjustable. The tamper may be operated independently.

The type "C" finisher is driven by a two-cylinder Le Roi 8 H. P. engine. All shafts are carried on either Timken or ball bearings, or in bronze or babbitt bearings. This finisher is furnished for standard widths of 8, 9, 10, 12, 14, 15, 16, 18, 20, 22, 24, 26, 28 and 30 feet. A machine designed for one width can be changed to another at a nominal cost by replacing the extension members of the trusses and installing cross members such as screed, tamper and belt of the proper length.

The manufacturer claims this finisher has ample capacity to keep up with a 21 or 27-E paving mixer when laying 800 to 1000 ft. of 18-ft. pavement in a 10-hour day. Where the mixer has greater capacity two machines are economical.

The company also makes a grade-rooter for work varying from light scarifying to heavier rooting, the grade-rooter being drawn by a tractor; or horses can be used for light work. It also furnishes a steel sub-grader for fine grading the sub-grade and thus insuring uniform thickness of concrete.

TYPE C LAKEWOOD FINISHER

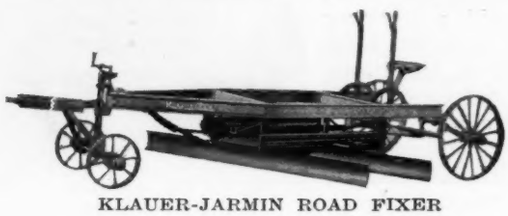
Road Fixer

The maker of the Klauer-Jarmin Road Fixer, the Klauer Manufacturing Co., of Dubuque, Ia., states that it is built on the principle of a long jack plane, with the two blades held rigidly where set, not raised or lowered by levers. The blades are attached to carrying beams which are held firmly but can be moved forward and backward between two heavy bars or "races," which are connected to the main frame by rigid uprights which prevent any up and down, choppy movement of the blades.

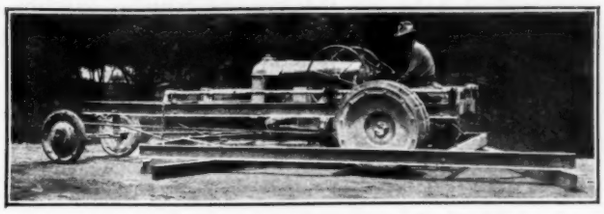
The wheel base is 156 inches; front wheels 36 inch tread, rear wheels 60-inch. The frame is of 5-in. channel steel reinforced with 5-inch channel braces. The blades are 6 in. wide and 8 or 10 ft. long, concave, reversible and sharpened on both sides. They can be set so that both cut equally, but in practice the front blade usually does the cutting while the rear blade smooths and packs the dirt. The draft on the blades is transmitted from the front end of the frame by a draw chain passing through a link, the ends of the chain being attached to the 2-blade drag riding in the sub-frame. A split rear axle permits the entire weight of driver and machine to hold the blades at work.

Gravel Road Maintainer

A one-man road maintainer using the Briley three-blade principle is built by J. M. Landenberger, Ft. Wayne, Ind., around either a McCormick-Deering or a Fordson tractor. The arrangement of blades is such that all material forced to the sides of the road by traffic can be brought in and distributed over the surface. The three ten-foot blades give the material thirty feet to travel. Any surplus is deposited



KLAUER-JARMIN ROAD FIXER



LANDENBERGER GRAVEL ROAD MAINTAINER

along the center of the highway instead of along the sides. The maintainer is built around, and not dragged behind, the tractor and thus can be held to exact position in the road. The driver can easily and quickly raise either or both sides of the float which carries the blades, at will.

Each blade is of high carbon steel, ½-inch thick, 6 inches wide and 10 feet long. The float which carries the blades is about twenty-one feet long. Besides maintaining gravel this machine can be used for preparing Kentucky rock or other road materials for the roller. By removing the center blade it can be used to remove snow, and by removing the rear blade, earth or gravel shoulders on paved roads can be dressed up.

The following have been described in the "New Appliances" section of PUBLIC WORKS this year.

Road Rollers—Galion Iron Works & Mfg. Co., Galion, O., February and September. J. I. Case Threshing Machine Co., Racine, Wis., May.

Graders, Maintainers, etc.—Galion Iron Works, Galion, O., April and September. Avery Power Machinery Co., Peoria, Ill.; J. D. Adams & Co., Indianapolis, and Glide Road Machine Co., Minneapolis, May. Russell Grader Mfg. Co., Minneapolis, September.

Earth Handlers—Western Wheeled Scraper Co., Aurora, Ill. (Street excavator) April. Barber Greene Co., Aurora, Ill. (Curb and gutter ditcher) July.

Face Rail Clamps—Heltzel Steel Form & Iron Co., Warren, O., May.

Sand and Gravel Washer—Eagle Iron Works, Des Moines, Ia., June. The Perfect Classifier Co., Nashville, Tenn., July.

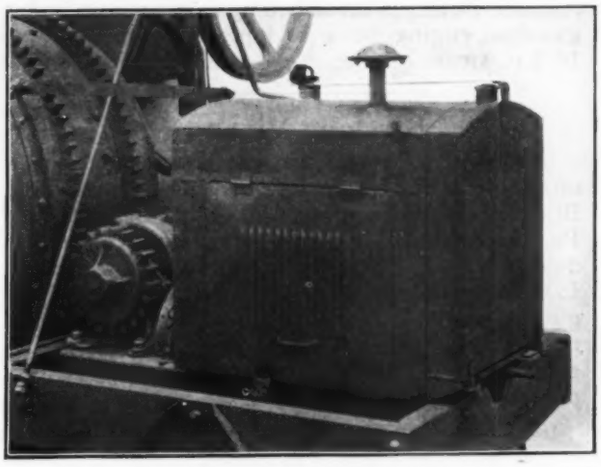
Pavement Heater—Good Roads Equipment Corp., Philadelphia, Pa., September.

CONCRETE MACHINERY

Mixer Radiator Guard

A radiator guard and lock is a recent addition to its 7-S Dandie Mixer furnished by the Koehring Co. to protect the radiator of the mixer from damage at night and at other times when the machine is shut down. This device is not included in the regular equipment but is furnished when specified.

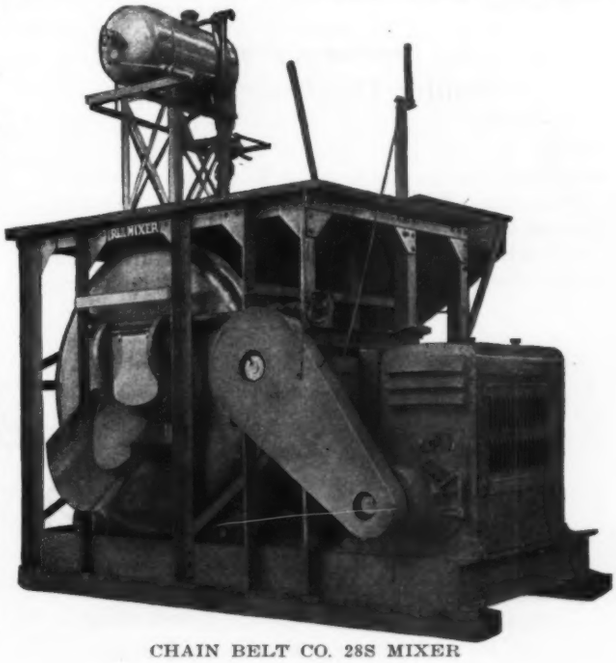
Another recent addition by this company is the installation of a 4-cylinder, 4x5, 900 r. p. m. Waukesha gasoline engine on the 28-S mixer; engine, gasoline tank and radiator being built into a rugged housing.



RADIATOR GUARD AND LOCK ON KOEHRING MIXER

A Chain Belt Six-Bag Mixer

The latest mixer brought out by the Chain Belt Company, Milwaukee, Wis., is the Rex 28-S, a high speed 6-bag machine for central mixing plants and large construction jobs. It is built with extra large drum openings and blades and deep, wide buckets. It is claimed that only 8 seconds is required for discharging the entire batch and 7 seconds to charge, thus permitting mixing a yard a minute on a 45 second mix. An overhead platform is provided with all control and operating levers grouped on it. The batch hopper holds 56 cu. ft. of loose material. The water tank can discharge 25 gal. in 6 to 8 seconds, or about the time required for the materials to enter the drum. The diameter of the drum is 70¼" and length 55", and speed 15½ R.P.M. The discharging chute is pivoted type with hinged cleaning shovel, power operated and automatic



CHAIN BELT CO. 28S MIXER

release. Power is furnished by a 32 h.p. 4-cylinder gasoline engine, or a 30 h.p. electric motor, or 18 h.p. steam engine.

Blystone Mixerette

For mixing mortar or small concrete jobs a mixer of 5 cu. ft. capacity is furnished by the Blystone Manufacturing Co., Cambridge Springs, Pa. The drum is all steel, acetylene welded. It dumps through a spout at wheelbarrow height. It is operated by a 3 HP Le Roi gasoline engine. It has Alemite pressure lubrication throughout. It is mounted on a 2-wheel running gear furnished with spiral springs, to be transported as a trailer.

Bag Cleaners

A bag cleaner for cleaning cement bags is manufactured by Jos. Wirth Co., Fond du Lac, Wis., which is said to have a capacity of 250 to 300 bags per hour. The outside is all iron and steel construction, while the inside contains a square cage which keeps the bags from rolling up. A hopper at the bottom holds several sacks of cement. It requires about ½ h. p. to operate and occupies a floor space of 3 feet 7 inches by 5 feet 7 inches and is 6 feet high.

The following have been described in the "New Appliances" section of PUBLIC WORKS this year.

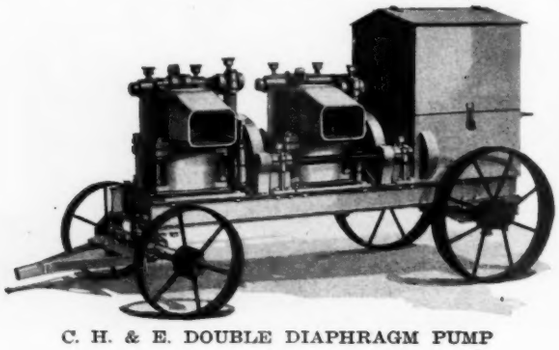
Mixers—Koehring Co., Milwaukee, Wis., September. T. L. Smith Co., Milwaukee, Wis., January and July. Chain Belt Co., Milwaukee, Wis., April. American Cement Machine Co., Keokuk, Ia., August. Construction Machinery Co., Waterloo, Ia., September.

Batcher—Heltzel Steel Form & Iron Co., Warren, O., February and June.

PORTABLE PUMPS

Double Diaphragm Pump

A double diaphragm pump with a capacity of 12,000 gal. per hour against 22 feet suction lift is manufactured by the C. H. & E. Manufacturing Co., Milwaukee, Wis. This really is two diaphragm pumps with a suction manifold that requires but one suction hose. A long discharge end leads the pumped water away from all working parts. The pump is operated by a Le Roi 4-horse one-cylinder gasoline engine which is entirely enclosed in a sheet metal housing. The truck frame consists of 4 inch channels tied together with heavy cast-iron base plates. The operating eccentric is cast integral with the large gear, which does away with the old style rocker arm.



C. H. & E. DOUBLE DIAPHRAGM PUMP

Portable Contractor's Pump

A pump known as the "Humdinger," made by the Ralph B. Carter Co., New York City, has recently been given two-wheel and four-wheel trailer mounting. The new trailer outfits are equipped with 24 by 3½ in. disc wheels and air-cell rubber tires with ball bearing axles and spring mounted above the axles. This permits the pump to be transported over roads at 25 to 30 miles an hour with perfect safety. The company manufactures a complete line of diaphragm pumps in both open discharge and force pump type, the original features being the use of a semi-hard rubber ball valve which is claimed to make it almost impossible for the pump to clog and to allow less slippage than the ordinary type of flap valve, enabling the pump to pick up greater suction and maintain greater vacuum than ordinary equipment.

A Lift and Force Trench Pump

A trench pump with a double 3-inch plunger unit is manufactured by the Humphryes Manufacturing Co., Mansfield, Ohio, which is provided with an outside packed plunger, thus permitting the packing to be easily tightened and replaced without in any way dismantling the pump. Among other features named by the manufacturer are: rotating rubber ball valves resting on machined seats; easy accessibility of valves; large air chamber in the discharge manifold taking the strain from the pump and hose; eccentric discs and shaft of cast steel in one piece; wide die cast babbitt bearings; I-beam section connecting arms; drain plugs located at both valves; base de-

HUMPHRYES' DIAPHRAGM PUMP

signed for two line of hose; and structural steel frames and steel trucks with 4-inch treads. Power furnished by Le Roi or horizontal engines, or with electric motor if preferred. It is claimed that this pump will force water to an elevation of 50 ft. in addition to a suction lift of 25 ft., and is also suited for open spout work.

The same company manufactures a trailer diaphragm pump designed for a suction lift of 25 ft. together with a force lift of 30 ft. The construction is similar to the pump just described except that it uses a standard Edson pattern diaphragm and is single; while the structural steel frame on which it is mounted is carried by two rubber cushion tired steel wheels. A worn diaphragm can be replaced by removing five brass nuts without dismantling any part of the pump. This is especially recommended to municipalities and public utilities for manhole pumping and similar work. A double diaphragm pump can be furnished mounted on four wheels.

OTHER APPLIANCES

Novel Contractors Torch

What the maker calls a "Bomb Shell Torch" is manufactured by the McCloskey Torch Co., Toledo, Ohio. The torch is entirely different from the ordinary lantern, being approximately globular in shape, self righting and claimed to be practically indestructible. It burns fuel oil, which costs much less than kerosene, and with one filling will burn from Saturday night until Monday morning. The torch is made of ⅛ inch sheet metal and holds 3 quarts of oil, which is burned by means of wicking, balls of which may be purchased at any hardware store. As they are practically of no use except for construction jobs, there is little danger of their being stolen. It is claimed that they remain lighted in the hardest wind or rain storm. They are 8 inches diameter and weigh about 11 pounds.

Compressed Air Tools

Pavement breakers, calkers, trench diggers, backfill tampers and other tools operated by compressed air are manufactured by the Independent Pneumatic Tool Co., Chicago, Ill., under the registered trade mark name of "Thor." The pavement breakers are used for breaking up concrete and other pavements,

FOR CALKING LEAD JOINTS

the trench digger for spading clay and other material, the calker for lead joints in water and gas mains and joints in sewer pipes, etc. For operating these the company manufactures a portable gasoline engine-driven compressor unit. This compressor is operated by a 32 HP, 4-cylinder engine, 4¾ in. bore by 6 in. stroke. It actually delivers 95 cu. ft. of free air per minute. The outfit mounted on a steel wheel truck weighs 2,700 lbs.

Electric Hand Saw

A portable hand tool operated by electricity for all sawing purposes up to four inches in thickness is manufactured by the Wodack Electric Tool Corporation, Chicago, Ill. Power can be obtained from any light socket by means of an extension cord. It is operated by a G. E. Universal motor 110 volts, 60 cycles or less. The blade is 11 inches diameter and is furnished with a safety guard on top and also one which falls by gravity around the other half when not in use. The entire weight is twenty-four pounds. An air blower brings air from a fan to the line, blowing away the saw dust. There is a swivel head for sawing at any angle and a sliding gauge for any depth of cut. The shafts are mounted on ball bearings. 8-inch, 9-inch, 10-inch or 11-inch blades may be used but unless specified 8-inch rip and 11-inch combination blades are furnished.

Portable Air Compressors

Portable air compressors have been specialized in by the Buhl Co., Chicago, Ill., for a number of years and one type was described in Public Works for April, 1925. Recently the company has developed an air compressor unit that can be quickly attached to or detached from a Fordson in less than twenty minutes. This is not an adaptation of a stock compressor for this purpose but was specially designed and built for attachment to the Fordson. This unit is claimed to be able to deliver from ninety to one hundred and fifty cubic feet per minute and to operate one large rotator rock drill, or two small rotators, or two pavement breakers, or three clay spreaders or four calkers, chippers or tie tampers, or two riveting hammers or a sand blast outfit. The unit is regularly equipped with standard Fordson agricultural wheels but if desired may be equipped with rubber tired wheels for rapid transportation on city streets or paved roads. This compressor is 6¼ x 6 inches double cylinder, vertical, hopper cooled, single stage compressor, entirely enclosed, with two 24-inch belt pulleys with 5½-inch face. The weight is 2,200 pounds.

The following have been described in the "New Appliances" section of Public Works this year:

Portable Air Compressor—Curtis Pneumatic Machinery Co., St. Louis, Mo., March.

Arc Welder and Compressor—Schramm, Inc., Westchester, Pa., September.

Air Motor Hoist—Ingersoll-Rand Co., New York, April.

Branding Torch—Combination Blow Torch Mfg. Co., Chicago, May.

Paint Spray Brush—Simons Paint Spray Brush Co., Dayton, O., June.

Garbage Disposal in Gary

By W. P. Cottingham*

The disposal of garbage in the city of Gary was one of the first problems that faced the present municipal administration upon their induction into office the first of this year.

For several years a contractor had been collecting the garbage and disposing of it by feeding to hogs. His hog farm was in a very unsatisfactory condition, but his contract price was insufficient to enable him to adequately serve the community or keep his equipment and plant in good condition. The market price of hogs was such that he was hardly breaking even on his contract. Consequently the service he was rendering was such as to bring a demand from the householders for a change.

The mayor and the board of public works, who have charge of all such operations, directed the city engineer to investigate the use of garbage incinerators in other communities. Several neighboring plants were visited and the officials became convinced that the complete destruction of garbage and refuse by incineration was a most desirable method of disposal. A questionnaire was prepared and sent out to cities of similar size or character in various locations to determine if any general type of plant prevailed. Based upon the data gathered in this manner the city engineer reported to the Board of Public Works in part as follows:

Of the Indiana cities, Terre Haute, Indianapolis, and Richmond were the only ones reporting any use of incinerators and in these cities very little use is made of the plants. Indianapolis has a reduction plant to handle most of their refuse and secures a profit from the by-products of their processes. Terre Haute has an old incinerator that is used when necessary and Richmond reports feeding to hogs "the best part of the garbage," burning the rest in a 10-ton Smith Incinerator.

South Bend, Fort Wayne, Kokomo, Marion and Muncie dispose of their garbage by dumping or feeding to hogs. South Bend and Fort Wayne have contracts for the collection and disposal at costs to the city of $30,000 per year in South Bend and $41,472 in Fort Wayne.

Many of the Michigan cities report the disposal of garbage under hog feeding contracts and state that the results are very satisfactory. Flint, Jackson, and Grand Rapids are following this method. Jackson is investigating a more desirable method and requested a report on the findings here.

Of the other cities addressed, reports of incerators were received from Joliet, Illinois and Racine, Wisconsin, where Goder incinerators are in use; from Atlanta, Georgia and Milwaukee, Wisconsin, where Heenan destructors are used; from Fort Worth and Dallas, Texas, where Superior incinerators are highly praised, and from Duluth, Minnesota, where a Nye plant is giving excellent service. St. Paul, Pittsburg, Columbus, Cincinnati, St. Louis, Kansas City, Birmingham, Detroit, and Toledo report the disposal of garbage by other means than incineration. Columbus reports a very satisfactory reduction plant yielding a profit to the city.

In summarizing the results of the questionnaire I find that eleven (11) of the thirty-three (33) cities are using some kind of incinerating plants and that no more than two of these cities are using the same type. The "Superior" plants at Dallas and Fort Worth are not using fuel other than the combustible material in the refuse. The Nye plant at Duluth uses no additional fuel, and the Heenan plant at Atlanta uses only cinders and waste coke as additional fuel. The Goder plants use some coal, reported from Joliet as from 300 to 500 pounds per ton of garbage and from Racine, as 5% of weight of garbage and rubbish.

Other details and data secured by the questionnaire on this subject will be of value in the approval of final plans for our plant.

In an attempt to secure further information, the plants at Evanston, Whiting, Hammond and Joliet have been visited. Each plant has its admirable features and some have objectionable features. The "Superior" plant at Evanston gives the most satisfactory impression but it must be recalled that the supply of combustible material in the garbage and rubbish in Evanston exceeds greatly what could be expected in Gary. Joliet shows a more comparable collection but the arrangement of the plant is not satisfactory and gives the impression of being very poorly designed and managed. The Hammond plant of the Jones Odorless type is giving satisfactory results but is reported as high in first cost and expensive to operate.

As a result of the study that has been made the recommendation is repeated that the selection of the type of plant be not made until after bids are received and that your Board proceed as rapidly as the council will permit to make the necessary arrangements to have a 50-ton plant constructed on the site at 9th Avenue and Taft Street.

No difficulty was encountered in securing the approval of the council and funds were provided by a bond issue to construct and equip a plant as recommended.

Bids were called for on a general specification and on the date fixed seven bidders filed their proposals with certified checks to guarantee their entering into contract if they were the successful bidder. The specifications called for a plant of two or more furnace units capable of consuming 50 tons of garbage and rubbish in ten hours without creating a nuisance by reason of smoke, dust or odors.

Of the bids received, only three were found to be within the appropriation and one of these eliminated himself by withdrawing his check while the lowest bidder's proposition was being investigated. The city officials made personal inspection of several plants built by the two bidders under consideration and after a careful analysis of the operating facilities of each type selected the plant of the Superior Incinerator Company and awarded the contract to them for $49,080, exclusive of ramps and service connections for water and sewer.

The plant chosen will be housed in a fireproof brick building 40′6″ x 50′0″, containing two furnaces 23′0″ x 16′0″ and 12′0″ in height, connected to a 100-foot stack through ample combustion chambers. Each furnace is made up of three compartments with separate charging hole for each compartment. Forced draft is provided to supply 6,300 cubic feet of air per minute to each furnace. The plant is to be completed and ready for acceptance test within three months.

At that time the city will cancel the present collection contract and assume the task of providing adequate service to the public. A fleet of light collection trucks with large capacity bodies will be secured and each collection unit will be put on a schedule to cover a portion of the city. Daily service will be undertaken in the business district and semi-

*City engineer of Gary, Ind.

weekly in the residence areas. The collection and disposal will be in charge of the street commissioner under the direction of the Board of Public Works. Construction of the plant will be in charge of the city engineer.

Rainfall in Sanitary Sewers

At the meeting this year of the New Jersey Sewage Works Association there was a brief general discussion of the subject of run-off from rains entering sanitary sewers. It was reported from Collingswood that no cellar or roof water conductors were permitted to connect to the sewers, but the city had copied from Camden the practice of placing a vent box at the curb line on each house connection and a great deal of melting snow and rain entered these boxes. The pumpage of sewage had jumped from 700,000 to 1,000,000 gallons due to rain or melting snow and even then much of it was overflowing through manhole tops and other places.

At Haddon Heights it was found that considerable water got into the tops of the manholes because of poor street grading but it had recently been discovered that the main trouble was faulty construction of laterals from the houses. The laying of these laterals had been in the hands of the local board of health, but after finding this condition the council passed an ordinance putting charge of this into the hands of the superintendents of streets and sewers, and also one requiring house connections to be made with cast iron pipe rigidly inspected before being approved.

At Pensauken it is required that sewers or house connections laid in wet, sandy soil be jointed with a poured composition, and that construction of connections from the sewer all the way to the house be inspected.

In Englewood the sewerage system is privately owned, and J. H. Coe of that city stated that the company required house connections to be laid with iron pipe and the company's inspectors watched the laying of the same although they were put in by the owners of the property. Two or three plumbers were found who were connecting cellar drains to the sewers but where these were discovered the owner was billed fifteen or twenty dollars additional rental for this drain and was very glad to take it out at once.

Sewage Treatment at Fitchburg

Synopsis of report for last year. No foaming in Imhoff tanks. Oil from garages troublesome; removal facilitated by surface flushing device. Hopper flushing. Cost of operation.

In making his reports for the year 1925 to the late David A. Hartwell, commissioner of public works of Fitchburg, Mass., Herbert B. Allan, chemist in charge of the sewage disposal works, said: "The sewage treatment plant has now been in operation over eleven years and during that time has accomplished very satisfactorily the work for which it was designed. The efficiency of the plant cannot be judged by the condition of the river below the point of discharge of the effluent because of pollution of the river by industrial wastes. A few tests of the river water made during warm weather and low stream flow conditions have indicated that the effluent was much better than the river water."

This plant is one of the most scientifically operated and studied plants in the country, and practically every year since it went into operation we have given a synopsis of the more interesting features of the annual reports made of it, together with some of the more important figures concerning operating details. It does not appear from the report that during 1925 there were many features of operation that called for special attention, but a few may be mentioned briefly.

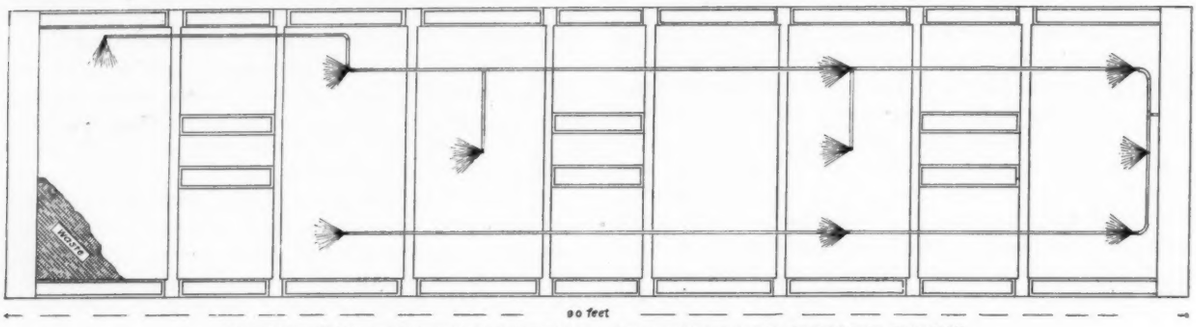
The rack screen at the head of the siphon line was raked twice a day, at 7 A. M. and 3:30 P. M., as in previous years. The amount of screenings removed averaged 2.25 cubic feet per day or approximately 0.70 cubic foot per 1,000,000 gallons of sewage treated.

In operating the Imhoff tanks there was no foaming in the vents nor congestion of the digestion compartments. The surface of sewage in the tanks was free at all times from gas-lifted sludge, indicating that all settleable solids found their way readily to the digestion compartments of the tanks. Analysis of the effluent indicated a removal of total suspended solids varying from 63.2 per cent in April to 84.2 per cent in June, with an average of 75.1 per cent for the year. The average detention period for the year was six hours and forty-three minutes. The amount of grease and floating material removed averaged 3.95 cubic feet per day or 1.24 cubic feet per million gallons of sewage treated. The settleable solids removed amounted to 99.99 per cent by volume, while 75.10 per cent of the suspended solids were removed. The dry solids deposited from raw sewage totaled 734.56 tons, while 71.37 tons of dry solids were removed from the secondary tanks into the Imhoff tanks, giving a grand total of 805.93 tons of dry solids settled out.

Waste crank case oil from garages has given considerable trouble during the past two or three years, greater volumes appearing at the tanks last year than ever before. It is necessary to remove this oil from the surface of the tanks as it "would become a factor in decreasing good biological action if allowed to pass with the tank effluent to the trickling filter." It was found that some garages were discharging waste oil directly into the sewers.

The material that had to be removed from the surface of the Imhoff tanks by skimming amounted to one per cent of the total volume of sludge removed from the tanks The labor of surface skimming has been greatly reduced by the introduction last year of the surface flushing device shown in the illustration, which has been installed in all five tanks.

The averages for the year of the weekly analyses give the following "oxygen consumed" figures: Crude sewage, 145.9; Imhoff tank effluent, 98.8; sprinkling filter effluent, 69.6; final effluent, 66.0. The reduction effected by the entire plant was 54.8 per cent total, 40.9 per cent dissolved and 64.9 per cent suspended.



DEVICE FOR FLUSHING SURFACE OF FITCHBURG IMHOFF TANKS

This consists of several fan-shaped jets of water playing on the surface of the sewage in the tanks, which force all grease and other floating matter directly to one corner of the tank and does away with the need of hosing the surface or wetting down walks, chimneys, etc. During the extremely hot weather the flushing device, operated twice each day, tends to eliminate odors that naturally would be released from the surface of the tank due to sun and high temperature.

In the issue of Public Works for January, 1925, was described a flushing device which had been installed in the hopper bottoms of two of the tanks. Experience with these last year showed that if properly operated they will relieve, to a great measure, the necessity for frequent cleaning of the tanks. Their full effectiveness, however, is prevented by heavy material that passs the grit chamber during flows from heavy storms.

Of the nozzles used on the trickling filters, the average number cleaned per day was 14.3 which was 3.75 per cent of the total number in use. The moth fly, common to trickling filters, has gradually become less numerous during the past four or five years and there were comparatively few this year. "An equilibrium appears to have been reached between the flies and their natural enemies the spiders, or ticks as the species on the filter is more properly called."

The total cost of sewage disposal maintenance last year was $15,649, equivalent to $13.25 per million gallons of sewage treated and to $.392 per capita served. This cost includes the cost of making repairs to the Imhoff tanks. With this excluded the operating expenses show a decrease over those of last year. Of the total cost of $13.25, 67 cents is attributed to the grit chamber, 27 cents to the siphon chamber, $8.37 to the Imhoff tanks, 81 cents to the sludge beds, $1.94 to the trickling filters and $1.24 to the secondary tanks.

The force at the sewage disposal works consisted of a foreman, two night watchmen, and from one to three laborers. The foreman has direct charge of operation and repairs all mechanical driven apparatus at the plant.

Grit Chambers for Combined Sewers

Grit chamber design for small towns with combined sewers is not a simple problem, for heavy grit deposited in sewers is brought to the grit chamber during storms, and, with velocities prevailing at such times, is carried through to the treatment plant beyond; and if the grit chamber velocity is below 0.6 ft. per sec. there will be deposited both grit and sludge unless this has been deposited in the sewers above. F. A. Dallyn finds that this material coats the filtros plates of activated sludge plants, interfering with aeration, and proposes the retention of flow in a storm tank for 20 or 30 min. (Abstract, in "Sewage Disposal Bulletin," of article in "Canadian Engineer.")

Cement Exports and Imports

The importing of steel into this country from abroad has excited some interest recently, but little seems to have been said about the importing of cement. It is true that the amount imported is not large, but it may impress some as being remarkable that any at all should be imported. The imported cement has come from Belgium, Denmark, Esthonia, Russia, France, Japan, Canada and Germany, the volume of recent importations being in the order given. The cement has gone largely to the New England States, Florida, Washington, Oregon, Michigan, and the cities of New York, Philadelphia, Galveston, Mobile and New Orleans; also Hawaii and Porto Rico.

During 1925 this country exported 1,019,597 barrels of cement and imported 3,655,317 barrels. During the first seven months of 1926 the exports total 602,397 barrels as against 537,470 for the corresponding seven months of 1925. During the same period, the importations were 2,234,803 barrels in 1926 as compared to 1,543,021 in 1925. While these figures seem large, they are, of course, small compared to the total amount of cement manufactured in this country.

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CONTENTS

Machinery for Public Work

Of machinery to take the place of labor in highway and other public work there appears to be no end. Picks, shovels, wheelbarrows, horses and carts, and to a large extent laborers, are no longer seen on such work. Power shovels, motor trucks, graders, concrete mixers, all operated by men with some knowledge of and reliability in the use of machinery, have taken their place. The old pick and shovel contractor could find few jobs even digging cellars today. And all the picks and shovels in the country could not do half the highway work each of the last few years has seen accomplished.

It is therefore no wonder that the most striking feature of the annual convention of the Road Builders Association is the show; nor that western contractors took such interest in an all-western road show last year that it is to be repeated this year and will probably become a fixed annual institution. Nor that we think it worth while to take this occasion to describe in this issue several dozen of the latest offerings in this line.

California's Vehicular Tunnel

As the New York-New Jersey vehicular tunnel nears completion, one in California enters its initial stages, as described in this issue. A comparison of the two is interesting. In the east, twin tunnels each 4,625 feet long are being built; in the west, one 2,436 feet long. The eastern tunnels are 29 ft. 6 in. outside diameter; the western, 37 feet. In the eastern, each tube has a 20-foot roadway and one narrow sidewalk; in the western, a 24-foot roadway and two narrow sidewalks. The eastern tubes will cost about ten times the estimate for the western.

The greatest difference is in the method of building. The eastern tubes are tunneled below the river bottom. The western tube is built in sections in a dry dock, floated to place and sunk to position. Many of the features of this are unique, although the general idea is by no means new. In 1907 ten twin steel tubes, each 23 ft. 4 in. diameter, were built on shore in sections 260 feet long, floated to place in forms used as a hull, and sunk to the bed of the Detroit river, the forms then being filled with concrete. The author is probably correct, however, in saying that the Estuary Subway is the first pre-cast tunnel to be constructed, transported in sections, and sunk to subaqueous position.

Disposal of Undigested Sludge

Elsewhere in this issue a prominent sanitary engineer makes a strong plea for "mechanical sewage treatment," from which "biological action . . . is utterly discarded," as a "practical proposition." Is it? We question it.

Without admitting the practicability of utterly discarding biological action, we suggest that special thought be given to the disposal of undigested sludge. This the author dismisses with little more than a wave of the hand, but sludge, and not the liquid effluent, has been the chief problem of disposal from the beginning and still remains so. Milwaukee and other cities have spent hundreds of thousands of dollars searching for a process that will dewater sludge conditioned by chemical, physical or bacterial action, or all combined, and the investigators seem to agree that without considerable prior bacterial action, mechanical dewatering is impracticable.

We hope that Mr. Johnson's argument will stimulate more general serious consideration of mechanical processes or aids to processes as elements of sewage treatment. We hope also that those competent to speak authoritatively on the subject will present their views of this idea, which is being given wide publicity by the author.

Sludge Digestion at Small Plants*

Preliminary observations and conclusions from studies made at small sewage treatment works in Maryland.

By T. C. Schaetzle †

The problem in the operation of sewage treatment works is that of accumulated sludge. No universally satisfactory method of disposing of sludge has yet been reached. The quantity and kind of sludge to be disposed of depends upon its degree of digestion. The best method of hastening and controlling sludge digestion is still under discussion. In the Engineering News-Record of December 4, 1924, the writer reviewed his experiences with some experimental studies on sludge digestion at the Baltimore City sewage treatment plant. This review showed that a relation exists between the degree of sludge digestion and its alkalinity. This work was undertaken just prior to the application of hydrogen ion concentration measurements to such studies. More recently, data have been presented by Rudolfs of the New Jersey Agricultural Experiment Station and Baity of Harvard, showing the relation between sludge digestion and pH values.

MARYLAND STUDIES

In Maryland there are a number of small institutional sewage treatment plants. This discussion will be confined almost entirely to these plants.

Various methods of seeding the tanks have been used or contemplated. Unfortuately, they have not progressed sufficiently far to warrant definite conclusions in all cases, but they have proceeded to such a stage as to make it possible to present a preliminary review of the Maryland situation.

Liming without chemical control was tried at the Maryland Tuberculosis Sanatorium and Montrose School for Girls. The former of these plants is an Imhoff tank installation and the latter a plain settling unit. In the Imhoff tank, lime was applied to the scum, which was churned in an effort to cause it to sink and combine with the sludge in the hopper. In the other instance, the lime was applied to the scum and the same was churned at frequent intervals. In the Imhoff tank installation, little scum could be made to sink, but in the plain sedimentation tank, the scum dropped to the bottom after a few weeks' efforts. In neither case, however, was it possible to obtain much improvement in the condition of the sludge.

At the Henryton Tuberculosis Sanatorium, lime was applied to the sludge in the digestion chamber of the Imhoff tank through a hose placed at the inlet end of the tank. In this experiment, 5 pounds of lime were applied daily and then increased to 10 pounds daily. It was the writer's intention to make periodic inspections determining the pH values in the field and gradually increasing or decreasing the lime applied until the proper pH value and type of sludge were obtained.

At the Maryland Tuberculosis Sanatorium Imhoff installations, where the addition of lime to the gas vents failed, all sludge was withdrawn from the tank and it was seeded with secondary Imhoff tank sludge. This procedure produced a much improved primary tank sludge, but not a completely digested one. At the Mt. Wilson Sanatorium the contents of an old privy were used for seeding the Imhoff tank and at another plant, cow or horse manure devoid of straw was to be used for seeding. In the first case, the seeding has been accomplished, but the tank has not operated sufficiently long to be productive of real good. In the other case, it has been difficult to obtain sufficient cooperation to bring about the seeding desired.

Following this preliminary work, it was decided to obtain samples of water, sewage and sludge from all the institutional plants, to determine the relation between these various materials preparatory to an attempt to obtain chemical control on the part of the plant superintended for the production of well digested sludge. In table 1, the types of tanks, the volatile matter, nitrogen, grease contents and pH values of the various sludges are presented. One exception to the institutional figures given in this tabulation is the one for the pH value of well digested sludge from the Baltimore City Sewage Treatment Works.

In table 2, there is presented the relation between the pH values of the tap water, the influents, effluents and sludges of the sewage treatment plants. Both of these tables present primary and secondary tank data. The data in table 1 are presented in figures 1 and 2. In producing these diagrams, the tanks have been separated into primary and secondary units regardless of whether the primary tank sludge is that from Imhoff, plain settling or separate digestion tanks. In producing the curves in figure 1, all volatile figures above 70 per cent have been grouped. The corresponding grease and pH values have likewise been averaged resulting in an average figure for volatile matter on the

*Contribution from the Bureau of Sanitary Engineering, Maryland State Department of Health, Abel Wolman, Chief Engineer.

†Senior Assistant Sanitary Engineer, Bureau of Sanitary Engineering, Maryland State Department of Health.

Table 1
Maryland Institutional Sewage Treatment Works
Sludge Analysis for Different Types of Tanks

Date 1926	Place	Type of Sample	Percent on Dry Basis Volatile Matter	Kjeldahl Nitrogen	Grease	pH Value	Remarks
6/4	House of Correction	Primary Imhoff tank*..	82.2	2.29	25.10	5.6	No plant grease trap.
5/25	Springfield State Hospital	Primary settling tanks..	81.1	—	15.50	6.0	No plant grease trap.
5/6	Mt. Pleasant Sanatorium	Primary settling tank..	79.6	—	7.58	6.4	Two plant grease traps.
5/6	Mt. Wilson Sanatorium	Primary Imhoff tank..	77.7	—	—	5.6	No plant grease trap.
5/3	Henryton Sanatorium	Primary Imhoff tank...	—	—	—	5.0	No plant grease trap.
6/3	Henryton Sanatorium	Primary Imhoff tank...	75.6	2.01	19.60	4.6	No plant grease trap.
5/6	Rosewood State Training School	Primary Imhoff tank...	72.6	2.04	20.80	5.9	Plant grease trap.
6/12	Aberdeen	Separate Digestion tank	48.4	—	9.70	6.9	No plant grease trap.
5/11	Crownsville State Hospital	Primary Imhoff tank...	33.9	1.27	6.78	8.8+ 8.6*	Plant grease trap.
5/25	Springfield State Hospital	Secondary Imhoff tank	71.7	5.34	2.76	6.8	
5/11	Crownsville State Hospital	Secondary Imhoff tank	52.5	3.41	1.56	8.8+	
May	Baltimore City Sewage Works	Separate digestion tank	—	—	—	7.1	
6/4	House of Correction	Secondary Imhoff tank	45.0	2.16	2.17	6.8	

*—Scum.

dry basis, or 78.1 per cent, with a corresponding grease content and pH value of 17.72 per cent and 5.7, respectively. From table 1 and figure 1, it is seen that as the pH value increases the volatile matter content decreases and likewise as the pH value increases the grease content of the sludge decreases. There apparently is no direct relation between the pH values and Kjeldahl nitrogen. Although there are only two results for secondary tank sludges, these analyses would seem to indicate that the same general relation holds true for secondary tanks. Figure 2 indicates that the per cent grease decreases directly with a decrease in volatile matter.

The data presented in table 2 show the pH values of the raw sewage increasing in most cases over that of the tap water. There are, however, exceptions in two cases. It is probable that this increase in pH value is due to the soap content of the sewage. It is interesting to note, however, that, at the Crownsville State Hospital plant, which is the only institutional primary unit producing a well digested sludge, the pH value of the tap water is 8.6 and that of the raw sewage is 8.0. At the same time the sludge produced here is one with a pH value greater than 8.0 in spite of a reduction from 8.0 to 6.8 as the sewage passes through the tank.

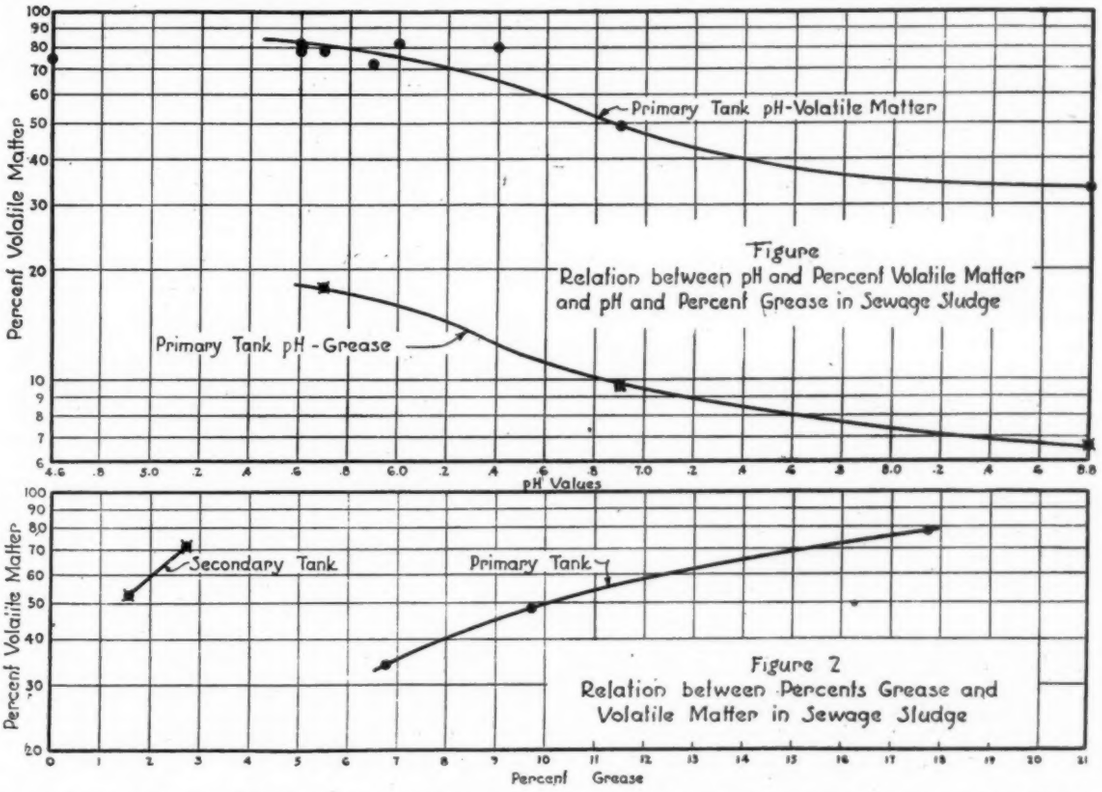


FIG. 1—RELATION BETWEEN pH AND PER CENT VOLATILE MATTER AND pH AND PER CENT GREASE.
FIG. 2—RELATION BETWEEN PER CENT GREASE AND VOLATILE MATTER IN SEWAGE SLUDGE.

Table 2
Maryland Institutional Sewage Treatment Works
Relation Between pH Values of Tap Water, Tank Influents, Effluents and Sludges

Date 1926	Place	Type of Tank	pH Values Tap Water	Influent	Effluent	Sludge	Remarks
5/3	Henryton Sanatorium.....	Primary Imhoff tank.....	6.4	7.0	6.2	5.0 4.9*	Thick scum in vents
6/3	Henryton Sanatorium.....	" " "	6.4	8.6+	5.7	4.6	" " " "
5/6	Rosewood State Training School	" " "	7.5	6.7	6.9	5.9	" " " "
5/6	Mt. Wilson Sanatorium.....	" " "	6.2	7.3	7.1	5.6	Seeded with privy contents. No scum in vents
5/11	Crownsville State Hospital.....	" " "	8.6	8.0	6.8	8.8+ 8.6*	Very little thin scum in vents
6/4	House of Correction.....	" " "	6.6	6.3	6.4	5.6	Thick scum in vent
5/25	Springfield State Hospital.....	Primary plain settling tanks	6.4	7.0	6.7	6.0	Thick scum on tanks
5/6	Mt. Pleasant Sanatorium.....	" " " "	6.9	8.6+	7.0**	6.4	Thick scum in vent
5/11	Crownsville State Hospital....	Secondary Imhoff tank....	—	7.3	7.2	8.8+	Thick scum in vents
6/4	House of Correction.....	" " "	—	6.4	6.3	6.8	" " " "
5/25	Springfield State Hospital.....	" " "	—	7.1	7.2	6.8	" " "

*—pH on scum.
**—Trickling filter effluent—no tank effluent available.

The data presented seem to indicate further, that the grease content of the sludge is associated with an acid condition and that simultaneously with the low pH values of the sludge and high grease contents, the pH values of the raw sewage are usually 7.0 or less. It will be noted, further, that the pH values of the tank effluents, whether they be primary or secondary tanks, are usually approximately the same or lower than the influent.

In the case of the Crownsville plant, where the pH value of the sludge is well on the alkaline side, the sludge produced is an excellent one and in all cases the secondary tank sludges are usually satisfactory. For all the plants where the pH values of the sludge are on the acid side, as shown in table 2, the sludge has been found to be entirely undigested, yellow in color and very foul smelling. The reduction in pH value below that of the incoming sewage and usually that of the tank effluents seems to indicate acid decomposition in the sludge itself.

The data presented by Rudolfs in the June, 1926 issue of PUBLIC WORKS, that obtained at Merchantville, Pennsylvania, and the data presented in this report seem to show the same general trend, namely: that undigested sludge is acid, a digested one, alkaline, and that with an increase in pH values there is a decrease in volatile matter.

CONCLUSIONS

Although the data presented are meager, the following conclusions seem warranted.

1. There is a relation between the pH value of the tap water and degree of digestion of the sludge.
2. When the tap water has a pH value greater than 8.0, the sludge probably will be well digested. When the tap water has a pH value less than 8.0 the sludge may not be well digested, unless its pH is artificially regulated.
3. In spite of the increase in pH value of the tank influents, probably due to soaps, there is an apparent acid decomposition taking place in the tank and sludge.
4. For primary or separate digestion tanks, the sludge probably will be undigested when the pH value is less than 7.0.
5. For secondary tanks, the sludge is apparently well digested when the pH value is 6.8 or above, extending perhaps as high as 8.8.
6. A definite relation exists between pH values and grease content of the sludge and between pH values and volatile matter content of the sludge. The higher the pH value the lower the grease content and the higher the pH value the lower the volatile matter content.
7. A definite relation exists between the grease and volatile matter contents of sewage sludge. With an increase in volatile matter, there is an increase in grease content.

Acknowledgment—The writer wishes to acknowledge the assistance rendered by A. E. Goodrich, A. P. Gwynn and A. W. Blohm in the collection of samples, by J. R. McComas in the preparation of the figures, and by the Bureau of Chemistry in making the analyses.

Schenectady Markets Sewage Sludge

An organized effort to sell the sludge produced at the sewage works at Schenectady, N. Y., which was begun slightly over a year ago, has met with remarkable success and bids fair to result in demand for the entire output of the plant in the future. To date, some 2,500 cubic yards of dried sludge from the two-story Imhoff tanks have been sold to the farmers of the county, and last year's production has been completely removed. The price charged has been from 10 to 25 cents per load at the plant. The farmers cart the material away in trucks and farm wagons. The average haul is 6 miles; the longest, 14 miles. Excellent results were obtained with the sludge last year, and the consensus is that it is as good or better than barnyard manure. All types of crops were benefitted and equal success was reported on both sandy and clayey soils.

When the attempt to sell the sludge was first

made, the plant superintendent enlisted the aid of the local Farm Bureau Association, which advertised the value of sludge as a fertilizer. Articles appeared in the local press and the Farm Bureau periodical. The Bureau also sent out a form letter to its members. Exhibits were displayed at meetings of market gardners, and the superintendent addressed meetings of the farmers in two places in the county. Samples of sludge were sent to Cornell University, and a letter recommending its use was received. This information passed rapidly from farmer to farmer, and sludge soon began to sell at the plant.

—Health News, N. Y. State Department of Health.

Mechanical Sewage Treatment

Bacterial mass action in sewage treatment cannot be controlled by man.

By George A. Johnson*

The treatment of sewage by mechanical means exclusively is an attractive and practical proposition. The idea has never been competently exploited, however, and consequently the value of mechanical sewage treatment remains to be demonstrated in practice. Too many engineers prefer to construct arguments intended to show why such processes are not workable. Too few are endeavoring to prove that they are.

All biologic processes are unreliable because bacterial mass action, upon which they depend primarily, is uncontrollable. All biologic processes are nuisance breeders in varying degree, and inevitably fail periodically for days at a time due to the uncontrollable nature of bacterial mass action.

A brief survey of the facts should be enough to convince the non-partisan mind that sewage can be effectively, inoffensively and consistently purified without the aid of biologic agencies. Elsewhere the writer has advanced a "catechism," which it seems worth while to repeat here, as follows:

A SEWAGE TREATMENT CATECHISM

Question 1.—Can sewage be clarified by mechanical means?

Answer 1. Yes, by screening and sedimentation. That aerobic conditions may obtain throughout, it is best that clarification be effected as rapidly as possible. This action can be accelerated by the application to the screened sewage of coagulating and precipitating chemicals prior to sedimentation. Also, mechanical provisions should be made to remove and dewater the sludge from the settling tank as fast as the deposit forms on the bottom thereof, thus precluding putrefaction.

Question 2. Can such a clarified sewage be consistently and effectively disinfected?

Answer 2. Yes, for all practical purposes, by chlorine or other sterilizing agents applied continuously in proper doses.

Question 3. What further purification is demanded before such clarified and sterilized sewage is discharged into public waterways?

Answer 3. Since no substantial deposits of sewage matter would occur, if discharged into the ocean or tide water, none. If discharged into fresh water, none until the sewage absorbing capacity of the stream or lake would be approximately equalled, and putrescent conditions liable to become established.

Question 4. Can dissolved and colloidal organic matter in a clarified sewage (see Answer 1) be destroyed by artificial oxidation?

Answer 4. Yes, by the aid of oxidizing chemicals or electrolytic action. A sewage so clarified and sterilized could be disposed of by dilution in any water without menace to the public health or the creation of nuisance, and the amount of unpolluted water required for dilution would necessarily be less per unit of sewage as the amount of dissolved and colloidal organic matter therein is reduced by artificial oxidation.

Question 5. Are there any conditions where such a treated sewage as that described in Answer 4 cannot properly be discharged into any public water?

Answer 5. No, for the reason that the sewage before discharge would be freed of suspended matter and floating oil, would be rendered practically sterile, and in every case the amount of dissolved and colloidal organic matter could be reduced to any required degree demanded by the volume and character of the water available for dilution of the sewage in the stream or lake. And for the further reason that all surface waters draining populated watersheds require filtration and sterilization before delivery into the public mains.

Question 6. Would such a system of sewage treatment be continuously reliable and inoffensive?

Answer 6. Yes, since it would be a mechanical process, entirely divorced from bacterial action such as all present "standard" sewage treatment processes depend upon absolutely. Being a mechanism pure and simple, and not a bacterial culture tank or bed system, it would be amenable to exact manipulation at all times, in all places, on all sewages, and applicable to large or small communities.

Question 7. How would the screenings and the sludge be disposed of?

Answer 7. They would first be subjected to a quick dewatering process, and afterwards dried by artificial heat applied at constant temperature. The resultant dry solids could be used as fertilizer, fertilizer base or fill. The sludge handling process, from first to last, would be inoffensive, and the entire treatment works could be located at any convenient point within a city, thus avoiding the cost of long outfall pipe lines, pumping stations, etc.

Question 8. Would the cost of such mechanical processes be higher than that of the "standard" biological processes?

Answer 8. No. The cost of mechanical systems for sewage treatment would vary with the degree of purification to be attained, as is true of all processes, but other things being equal, and as an average proposition, the cost would be no greater than that of the biological processes.

ARGUMENT

Sewage can be clarified by screening and sedimentation, and more quickly clarified when coagulating chemicals are used. It is equally true that a clarified sewage can be sterilized competently with chlorine compounds and other chemicals. So, also, can the oxygen absorbing powers of sewage (putrescibility) be diminished at will by oxidizing chemicals, electrolytic action and ozonized air. All of these physical func-

*Consulting Engineer, 150 Nassau Street, New York City.

tions depend only upon methods of plant operation. These can be standardized and made virtually automatic. With biological activities discouraged at every step in the process, nuisance factors necessarily will be reduced to a minimum. So much for the liquid sewage.

Screenings can be disposed of by incineration or burial, as at present.

Sludge can be quickly and inoffensively dewatered and dried in machines, the efficiency of which already has been proved in practice at numerous sewage disposal plants.

The drying process is inoffensive and practically complete, and the dry sludge, not having been subject to prior putrefaction, is of value as fertilizer.

CONCLUSION

Sewage of any character, in any volume, in any climate, can be purified to practically any degree desired, by controlled mechanical means exclusively. Uncontrollable and nuisance breeding biological action, such as all "standard" sewage treatment processes now depend upon, is utterly discarded. In consequence nuisance factors are eliminated, and uncertainties and periodic failures in the processes of sewage treatment in vogue today are supplantable by readily controlled mechanical systems.

Marion Sewage Treatment Plant

Report for first year's operation of plant using glass-covered sludge drying beds. Beds used to only half their capacity. Imhoff effluent passes through fine screens. Tanks foamed continuously four months. Fighting the moth fly. Effectiveness of treatment.

A new sewage treatment plant was placed in operation July 1st, 1924, at Marion, Ohio, consisting of bar gratings, grit chambers, Venturi meter, two-story or Imhoff settling tanks, dosing tank, trickling filters, secondary setting or humus tanks, glass covered sludge drying beds and a pumping plant. There are an office and laboratory building, a pumping station, and a brick building housing the bar gratings and control gates which divert the flow to either the grit chambers, the dry weather channel or the main by-pass. The works were designed to serve a population of 40,000 persons, which it was estimated would be reached by the city by 1935 or 1940.

The plant cost $539,200, of which $28,800 was for channels, conduits and pipe lines, $5,400 for bar gratings and grit chambers, $76,800 for two-story settling tanks, $33,400 for glass covered sludge drying beds, $29,100 for pumping installation, $14,800 for dosing tanks, $186,500 for trickling filters, $29,700 for final settling tanks, $38,400 for buildings, $24.700 for parking, and $10,600 for miscellaneous; to which was added $23,580 for land and $37,420 for engineering and inspection.

The works are located about three miles from the center of the city and one mile west of the corporate limits. There are no houses within 2,200 feet except one owned by the city 1,300 feet away.

The sewage enters the works through a three-way channel. In each channel is a bar grating of ½ by 2½-inch bars with 1½-inch clear openings. The bars are inclined at an angle convenient for hand raking and at the top of each grating is a platform for draining the screenings.

After passing the bar gratings the sewage enters either one or both of the grit chambers or the dry weather flow channel. There are two grit chambers, each with 5,000,000 gallons per day capacity at one foot per second velocity with a normal detention period of fifty seconds. The chambers are shallow at the inlet and outlet ends and deep in the center.

Each of the four Imhoff tanks is 30 x 60 feet with a maximum depth of 29 feet below the flow line, giving a total capacity of 4.01 cubic feet per capita of which 2.01 cubic feet is in the sludge compartment. The bottom of the sludge compartment is in the shape of a channel rather than hopper bottoms. The sewage enters the tanks through cast iron pipe instead of open channels. These discharge into skimming chambers, in the bottom of which are two rectangular outlet ports into the tank proper. Adjustable scum boards in the settling compartment assist in distributing the flow. The tanks are the same at both ends, to provide for reversing the flow. The effluents discharge through ¼-inch mesh screens placed across the skimming chambers at the outlet end to hold back any floating material. The normal detention period is 120 minutes. The gas vents constitute about 18 per cent of the total tank area and are closed with hinged wooden covers. Two-inch irrigating pipes are conveniently located for stirring up the sludge.

Pumping being necessary because of insufficient head, one four-million and two three-million gallon motor-driven, horizontal, centrifugal pumps of De Laval make were installed operating against a total head of twenty feet. In the pumping station are also an air lift to operate a driven well, a pressure tank and pump for supplying water to the grounds and buildings, a compressor outfit to furnish air for the well and sludge ejector, and a heating plant.

The effluent from the Imhoff tanks is pumped to the twin dosing tank which consists of two compartments each with a capacity of 38,500 gallons. In this tank are twin alternating thirty-inch siphons. These insure the same dose being applied to the filters at each discharge, variations in flow only increasing or decreasing the frequency of dosing. The maximum rate of each siphon is 7,000 gallons per

minute. The bottoms of the tanks are sloped to give a uniform distribution of spray on the filters. The siphon begins to operate with a head of 7.9 feet and the siphon "sniffs" and the discharge stops at a minimum head of two feet.

From the dosing tank the settled sewage is sprayed onto the trickling filters, of which there are four of 0.35 acre each. The sewage passes through a 2 ft. 8 in. by 3 ft. distributing conduit to 8-inch lateral distributors set thirteen feet apart and laid directly in the stone just beneath the surface. Each lateral distributor can be shut off or flushed, the flushings being discharged into side galleries. The nozzles are of the circular type with 13/16-inch orifice, spaced on fifteen feet centers and so arranged as to form apexes of hexagons. The filtering material consists of two-inch broken limestone ten feet deep.

There are four secondary or final settling tanks of the plain horizontal-flow type, each 60 x 15 feet with a maximum depth of 15 feet, with a trough bottom extending the entire length. The normal detention period is 45 minutes. The sludge from these can be pumped to either the Imhoff tanks or sludge drying beds.

The sludge from the Imhoff tanks is lifted by a pneumatic ejector to the sludge beds, of which there are ten, each with an effective drying area of 74 x 17 feet. Each bed contains 12 inches of sand resting on gravel in which is a 6-inch tile drain with open joints. The entire sludge drying area of 12,580 square feet is enclosed by glass of standard green house construction.

Control devices permit the entire plant or any one of the treatment devices to be by-passed, or any predetermined quantity of sewage can enter the plant, the excess passing direct to the river. A wooden flap gate prevents high water in the river flooding the filters and final settling tanks.

The grounds about the plant have been graded and shrubbery and trees planted along the roadways and around the buildings. Four flood lights have been so placed that practically all parts of the plant can be illuminated for working at night.

OPERATION OF THE PLANT

Report of the operation of this plant for the first complete year, that ending Dec. 31st, 1925, has been made by F. G. Browne, superintendent and chemist, to O. A. Benedict, director of public service. Some of the more important features of Mr. Browne's report are given below.

The average daily flow to the plant was 1,183,720 gallons as measured by the Venturi meter and checked by the counters of the dosing tank. The maximum flow for any twenty-four-hour period was 3,081,000 gallons and the minimum was 470,000. For about two hours during a heavy rain storm a flow at the rate of 9,500,000 gallons was recorded, the maximum for the year, which indicated a great deal of storm water entering the sanitary sewers. The normal flow generally falls to less than 500,000 gallons at night. The average flow is equivalent to about 55 gallons per capita of population served by the sewers. The sewage delivered to the works is a strong domestic sewage. From June to October dissolved oxygen is usually absent and the incoming sewage is nearly always black and septic, particularly in hot weather. During the cold months, the sewage usually arrives at the plant in a fresh condition and often contains dissolved oxygen.

The bar gratings are raked hourly and the screenings, after draining in a box with a perforated bottom, are wheeled to a trench about 150 feet distant and buried. The amount of these screenings averaged 1.9 cubic feet per million gallons of sewage treated.

The grit chambers removed about 25 cubic yards of grit during the year. Black oil floating on the surface of the sewage was skimmed off and buried with the screenings, about 925 gallons having been removed during the year.

Owing to the relatively small flow of sewage, only two of the four Imhoff tanks could be used to advantage at a time, but an effort was made to use all about the same number of days during the year. The direction of flow of each tank was reversed at the end of each month. The thickness of scum in the gas vents varied from three feet to ten feet. Once a week holes were punched through the scum to permit the gas to escape more readily. The slots were scraped daily with squeegees. Measurements were taken the first of each month by the pitcher pump method to determine depth of sludge. Alkalinity was usually determined once a week, using a methyl orange as indicator. The alkalinity averaged about 1,650 varying from 725 to 2,550 parts per million. The pH values ranged from 7.2 to 8.0. It was noted that as the pH approached 7.0 gasification increased.

Except for a few days, all the Imhoff tanks foamed continuously from January 1st to May 15th. After May 15th there was no foaming except two days in the case of each of the tanks. Temporary relief was obtained by resting the foaming tank and washing down the scum with stirring. Lime added to the gas vents, fresh water forced into the digestion chambers and compressed air were tried to stop the foaming but with little or no success. Removing a large volume of sludge from each tank brought it back to normal condition. It was concluded that the tanks had passed through the ripening stage by May 15th and that no further trouble from that source is to be expected. These tanks effected an average removal of 66.8 per cent of the total suspended solids, varying from a minimum of 50.5 per cent in

INTERIOR OF MARION, O., SLUDGE BEDS

January to a maximum of 73 per cent in November. The total dry solids deposited in the tank during the year was equivalent to 37.5 grams per capita per day.

Tests were made to determine the uniformity of distribution on the trickling filters by the nozzles and this was found to be satisfactory. The alternating feature of the dosing tank is considered to be highly desirable and to work out well in practice. The most frequent cause for trouble with the dosing tank has been leaking weirs, dirty counter-balanced flap gates, and the accumulation of grease balls. The compartments are cleaned regularly. The trickling filters were by-passed 62.3 days either because of high water in the river, no power for pumping because of accidents to transmission lines, or to rest the filters during February and March when the flow in the river provided ample dilution.

The routine work on the filters consisted of cleaning the nozzles, distributors, galleries and underdrains. The distributors were flushed 18 times and the underdrains seven times. The latter were examined with jointed sewer rods to see if there were any stoppages with stone or sand, but none were found. The pressure flume was flushed occasionally to remove deposits. Deposits from the pressure flume and the distributors were very black, septic and odorous.

There was no serious clogging of nozzles, an average of twelve per day being cleaned, out of a total of 3,580. The clogging material consisted mostly of matches, grease balls, seeds and a stringy growth from the interior of the distributing system. All nozzles were removed in May and December for a thorough cleaning by boiling them in a strong soap solution and then brushing or scraping. This was necessary to preserve uniformity of distribution of sewage, as deposits on the spindles caused a stringy spray.

There was no growth on the surface of the filters except a very little green algae. The stones, however, were covered with a gelatinous growth and contained the usual animal life. The moth fly first appeared as a nuisance on May 20th. Chloride of lime at the rate of 150 parts per million available chlorine was applied May 30th, but there was no permanent effect. On July 1st and again on August 6th and 16th the beds were again dosed with chloride of lime, the last two at the rate of 200 parts per million. Mr. Browne was not able to state whether this treatment has any merits, but it was found that it did not reduce the nitrification but did cause a sloughing off of fine humus which did not settle readily in the final tanks. On August 22nd to 25th all the filters were flooded to kill fly larvae and this was very effective. Spiders became numerous in the filter in September and October and it is hoped that an equilibrium will be established between them and the flies, as at Fitchburg.

Sludge from the Imhoff tanks was pumped onto the drying beds ten times during the year, while a slightly greater amount was pumped onto an adjacent field for filling up holes and grading. The wet sludge from the tanks contained 5 to 12 per cent of solids, averaging 7.5 per cent. The sludge was apparently well digested, was odorless and dried readily. During the year several tests were made to determine the rate of drying on the glass covered sludge beds at different depths and at different seasons. These experiments indicated that in summer 10 inches of sludge averaging 7.5 per cent solids can be removed in fifteen days or less. The sludge beds were not utilized any where near to capacity during the year. The experiments seemed to indicate that about 7,500 cubic yards of sludge, three times that actually applied, could have been disposed of, if necessary, an equivalent of 0.60 cubic yard per square foot per year. Truck farmers took some of the dry sludge removed from the beds and reported it good fertilizer for garden produce and potatoes. The sludge so removed contained solid contents varying from 97.8 to 26.8 per cent and averaging 50 per cent. The average total nitrogen in a composite of the dried sludge was 2.3 per cent. The fixed solids in the composites for the year from each of the four tanks varied from 46.4 per cent to 53.0 per cent and averaged 50.4 per cent.

The lawns and shrubbery have been kept up with a neat appearance at all times, a gasoline driven lawn mower having been purchased for this purpose.

The prevailing odor about the Imhoff tanks is that of hydrogen sulphide, which is noticeable in the nozzle spray also during hot weather. The intensity of the odors and the distance they carry with the wind depends upon the condition of the sewage as received at the plant and of the tanks. It was seldom that odors could be detected at the road 1,200 feet from the center of the plant. A hog farm is maintained adjacent to the plant and odors from this have sometimes been attributed to the disposal plant.

The operating force consisted of a superintendent and chemist, an assistant superintendent and foreman, three attendants, and two laborers. The firm of Geo. B. Gascoigne was retained in a supervisory capacity. The superintendent and chemist performs the laboratory work with the assistance of the foreman. The latter has direct charge of the outside work. The attendants take hourly samples and have charge of the pumps and pumping station. During the six warm months only one man is on duty at night but during the six cold months two men are on duty.

The cost of operating the plant for the year totaled $20,447, of which $14,174 was for labor; $4,811 for material and $1,462 for equipment. The item of labor includes also consulting services. The totals for the several items were:—Administration $1,785; laboratory $2,658; bar gratings $711; grit chamber $522; Imhoff tanks $2,405; sludge disposal $1,196; pumping station $3,140; dosing tank and trickling filters $1,262; final tanks $1,151; upkeep of grounds $964; miscellaneous $26; power $2,833; equipment and tool account $631; fuel and heating system $640; Ford car $522. The plant was operating at only about one half or one third its capacity and as it approaches full capacity the unit costs should be substantially reduced. Deducting the cost of pumping to the dosing tanks, the net cost of operation and maintenance on the basis of a similar gravity plant may be placed at approximately $15,000.

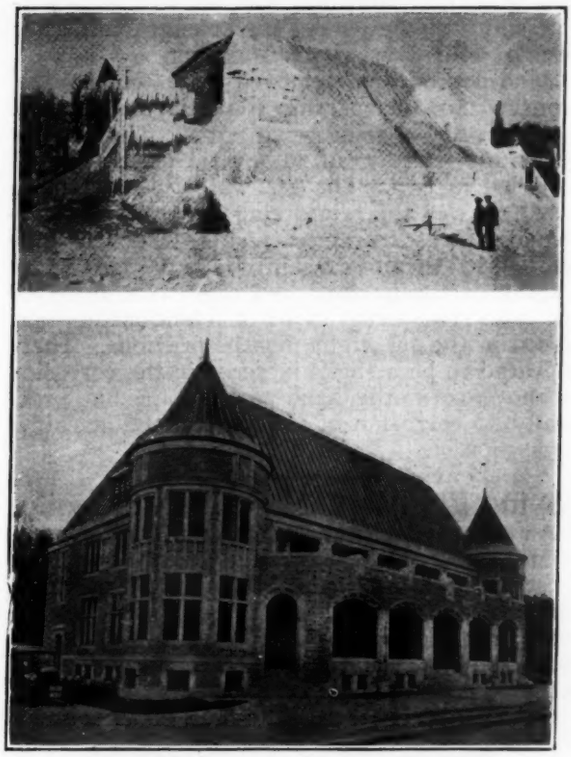


TABLE ROCK HOUSE, NIAGARA FALLS, BUILT UNDER ICE-COVERED PROTECTING STRUCTURE.

An Unusual Winter Construction Job

During the past few years there has been a very great increase in interest in and examples of construction work during cold winter weather. For buildings, this usually involves more or less complete enclosing of the structure and creation of artificial heat. The accompanying illustrations show the Table Rock House, Niagara Falls, Ontario, which was constructed last winter, and the appearance of the protecting structure within which it was built and the interior of which was heated during construction. The unusual amount of frost and ice on the structure is due to the spray from the Falls, which were immediately beneath the building. Inside the shell the temperature was kept at approximately sixty degrees at all times, one object of this being to prevent accumulation of sufficient ice to destroy or bury the structure.

These facts and illustrations are from an article published by *Contractor and Building Supply Journal*, of Toronto, Canada.

Blowpipe Cutting a Cast-Iron Main

The use of the oxy-acetylene blowpipe for cutting steel plates, pipes and other steel sections has become familiar to all, but the use of such equipment for cutting cast iron is not so common. Recently the superintendent of waterworks of an Ohio city found it necessary to replace a worn gate valve in an old line of 36-inch cast iron pipe. As the valve was in the supply main, the pump would have to be shut down while the work was in progress, and he wished to use the method which would require the least time and decided that the oxy-acetylene blow pipe was perhaps the most expeditious. As the cost of this job was estimated to be $300 he decided to purchase an equipment for the purpose. The manufacturer of the apparatus furnished an operator to instruct the superintendent in the use of the torch and incidentally to perform or superintend this job. The operator reported Saturday evening and started to cut the pipe at 10 o'clock, finished in an hour and twenty minutes, and the new valve was inserted and pressure turned on again in less than 3 hours.

This good time was made in spite of difficulties, one of which was that the valve used to shut off the water in the line leaked badly and there was about 6 inches of water in the bottom of the pipe when it was cut. Also it was close to a wall and the quarters in which the operator worked were contracted.

In the meantime the company had been extending a 36-in. main several hundred feet, each joint being imbedded in concrete to about one-third the depth of the pipe to prevent settling. When the water was turned on one of the pipes was found to be full of sand holes, which required its removal. To remove a length of 36 in. main, weighing 3,000 lbs., is no easy job and it was decided to cut out the imperfect section by means of the torch. This pipe also had

SERVICE MAN INSTRUCTING OPERATOR IN CUTTING CAST IRON PIPE.

EIGHTEEN-INCH SECTION READY TO BE REMOVED.

water in the bottom and the cut was started on the under side, both to drain the water out of the pipe early in the work and also because, if the top had been cut first, the slag would have piled up on the bottom of the pipe adding to the thickness of metal requiring to be cut. (The pipe was 1⅞ in. thick). The pipe was first cut in two in the middle and a second cut made about 18 in. away. This 18-in. section was then lifted out with a hoist. Meantime the lead had been melted out of the joint near which the sand holes had been found by use of a welding blow pipe and the end of the pipe between this joint and the cut was then pulled out of the bell and lifted from the trench. A new piece of pipe 4 inches shorter than the combined length of the two pieces removed was cut and slipped into the bell, a sleeve having first been slipped over the good section of pipe remaining in position and then moved forward so as to cover the 4 in. gap. When this sleeve had been leaded and calked the line was in condition for use. This entire repair required less than one day and a half.

Effect of Salt Water on Concrete Pipe

In 1923 the State Highway Department of South Carolina began the extensive use of reinforced concrete pipe for culverts. Many of these where placed were subject to salt water tide action and rumors of failures of such pipe began to reach the department. In order to determine the actual effect of such conditions on such pipe, tests were started in May, 1924. Eighteen-inch reinforced pipe made by the hand-poured method was placed in the ocean at Charleston on July 1st, 1924, midway between high and low tide, the tidal range here averaging about six feet. The pipes were previously subjected to a simple hydrostatic test by sealing one end, standing the length of pipe on this end and filling it with water, then counting the leaks that appeared within ten minutes. The pipes tested averaged about twenty leaks to a three-foot joint, mostly along circular rings opposite the reinforcing wires. It seemed probable that concrete which would permit the passage of water through the pipe walls as readily as this would not provide protection against corrosion of the reinforcing steel by salt water.

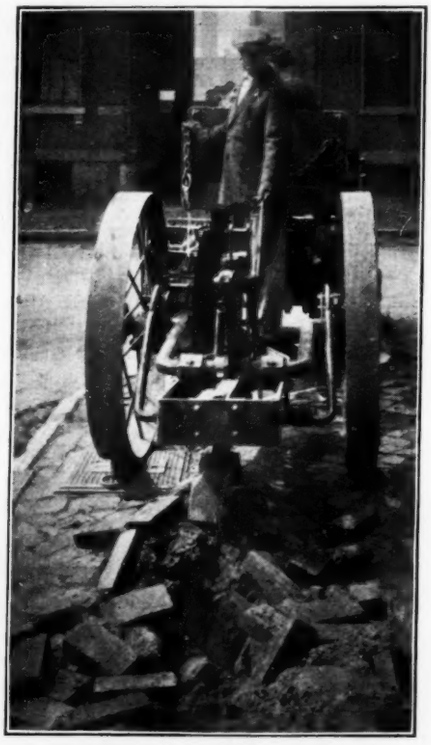
An effort was then made to secure a pipe which would be more impermeable and experiments, such as the use of Celite and hydrated lime, the use of small-size coarse aggregate and additional cement, and variations in consistency and manner of tamping, were tried. Pipe from four different manufacturers was tested for leakage and it was found that the leakage was greatest in the pipe made with a comparatively dry mix.

In July, 1925, eighteen joints of eighteen-inch machine-made reinforced concrete pipe were placed in the ocean. These were made with a very dry mix and showed a high absorption rate of 8.3 percent. Further experiments showed that a rather wet mix could be used by slightly increasing the percentage of crushed stone. With such mix the absorption was reduced to 6 percent and the pipe passed the strength test after three or four days of steam curing.

Hand-poured pipe removed after ten months' exposure to tidal action showed considerable corrosion of the reinforcing wires. The number 8½ gauge wires were, in several places, almost corroded in two. The sea water was found to have followed the reinforcing wire for considerable distances from the points where it penetrated to them. In March, 1926, two more lengths of the haud-poured pipe were removed and also two lengths of machine-made pipe, placed in the sea eight months previous. There appeared to be a slight increase in the corrosion of the wire in the hand-poured pipe but practically no corrosion of the wire in the machine-made pipe.

Laying Electric Cable With a Subsoiler

An electric cable was laid under a brick sidewalk in St. Louis by A. M. Ryckoff, a Chicago contractor, by attaching the cable to the blade of an agricultural subsoiler which ripped up the bricks and laid the cable in one operation. The earth and bricks fell back behind the blade and the bricks were afterward relaid. The only difficulty encountered was obtaining sufficient power to handle the outfit, the contractor adopting for this a five-ton Caterpillar tractor. With this outfit two men laid 240 feet of 1½-inch electric cable in six minutes. This work was part of a one and a quarter million dollar contract for street and electric light work being carried out by Mr. Ryckoff.



LAYING ELECTRIC CABLE WITH A CULTIVATOR

Recent Legal Decisions

DAMAGES FOR LAND CONDEMNED FOR ROAD

The Kansas Supreme Court holds, Flemming v. Board of Comrs. of Ellsworth County, 240 Pac. 591, that in a proceeding to condemn private property for public use in laying out a road, the landowner is not entitled to damages or compensation for premises not described in his claim for damages; but he is entitled to interest, or, what amounts to the same thing, to damages in the nature of interest, between the time of the appropriation and the time of the rendition of judgment.

DEFINITION OF "PUBLIC WORKS"

The Wyoming Supreme Court. State v. A. H. Read Co., 240 Pac. 208, holds that a contractor engaged in street paving work for a municipal corporation, was engaged in public or municipal work within Wyo. Const. art. 19, Sec. 1, and Comp. St. 1920, Sec. 4308, declaring eight hours of actual work to constitute a lawful day's work on all state and municipal works, notwithstanding that it was being done under Comp. St. 1920, Secs. 1966-2040, authorizing assessments upon land specially benefitted to defray the cost and expense thereof. The term "public work" is said to be defined as "all fixed works constructed for public use, as railway, docks, canals, waterworks, roads," etc. Where it was contended that a sewer improvement was not a "public work" because it was paid for wholly by property owners, it was said, Seibert v. Cavender, 3 Mo. App. 421: "If this be true, then the macadamizing, curbing, etc. of streets, being also paid for by the property holders exclusively, are for the same reason not public works. * * * The truth is, both sewer building and macadamizing of streets are public works, within the meaning of the charter (of St. Louis). Both are done under special city ordinances. Both are done under contracts made by the city officers. Both are paid for by assessments against the property owners, enforced by special tax bills."

CONTRACTORS HELD NOT LIABLE FOR INJURY TO PIPES LAID IN BRDGE IN ABSENCE OF NEGLIGENCE

Where, in the improvement of a street, it was necessary for the contractors to destroy a bridge thereon by dynamite, it was held, Singer v. Washington Water, Light & Power Co. (Ind. App.) 149 N. E. 918, that it was the duty of a public utility corporation which owned a pipe line embedded in the concrete of the bridge, and which had notice of the proposed improvement and removal of the bridge, to protect its pipes, and, in the absence of negligent injury to the pipes, the contractors were not liable to the utility for injury to them.

ORDINANCE AS TO REPAIR OF BUILDINGS WITHIN FIRE LIMITS HELD VALID

The Washington Supreme Court holds, Behrend v. Town of Pe Ell., 240 Pac. 12, that an ordinance providing that no building within the fire limits should be repaired if the repair would exceed 50 per cent. of the value of the building is constitutional although it does not provide a method for determining the value, a standard being set and not left to the discretionary power of the council and the ordinance operating on all alike.

CITY HELD NOT LIABLE FOR LOSS OF PROPERTY BY FIRE FROM NEGLIGENCE IN PLACING CURBSTONES AROUND HYDRANT

North Carolina Comp. St., Sec. 2807, provides that a city maintaining its own light and waterworks system "shall in no case be liable for damages for a failure to furnish a sufficient supply of either water or light." The North Carolina Supreme Court holds, Mabe v. City of Naiston, 190 N. C. 486, 130 S. E. 169, that in view of this provision a city cannot be held liable for the destruction of a house by fire because of the alleged negligent placing by the street department of rocks or curbstones around a hydrant, in violation of a city ordinance, making it impossible for the fire department to save the property. The authorities show that the same holding would follow, even in the absence of such a statute.

PLATTED TERRITORY ADJOINING STREETS SUBJECT TO ASSESSMENT

The Kansas Supreme Court hold, Atchison, T. & S. F. Ry. Co. v. City of Ellinwood, 238 Pac. 341, that for purposes of assessment to pay for the improvement of a street in a city of the third class, pieces of plated ground which adjoin the street to be improved cannot be regarded as unplatted territory, but are subject to assessment as platted territory, although not entirely surrounded by streets; and unplatted territory lying beyond the part that is platted and which does not adjoin the street is not subject to the assessment.

DEPOSIT WITH BID HELD NOT RECOVERABLE AFTER BID ACCEPTED AND CONTRACT COMPLETE

In an action by a contractor against a city for return of a deposit made with plaintiff's bid, the North Carolina Supreme Court holds, Elliott Bldg. Co. v. City of Greensboro, 190 N. C. 501, 130 S. E. 200, that when the plaintiff filed its written bid or proposal for the construction of a water and sewer system, containing definite terms, and the defendant accepted it, the contract was complete, the acceptance having been made within a reasonable time, and being identical with the offer. After acceptance the money deposited with the bid could not be recovered. The deposit was to guarantee that plaintiff would execute the contract, with the bond contemplated, if its offer was accepted. The contract provided that subletting could only be done with the written assent of the city. The plaintiff claimed

that a letter in which it advised the city that it would sublet the machine work was such a modification as to constitute a new bid and withdraw the old. It was held that the letter was not a modification, but, at most, only notice that, if the bid was accepted, plantiff's right to request permission to sublet would be exercised.

ADJACENT OWNER'S REMEDY FOR VIOLATION OF ZONING ORDINANCE

The Ohio Supreme Court, in Kritz v. Messer, 113 Ohio St. 149 N. E. 30, holds that a property owner, residing in a municipality in which a valid zoning ordinance is in full force and effect, has the legal capacity to apply for an injunction against the erection of an apartment building upon a lot contiguous to her real property, upon the ground that the proposed structure will violate the zoning ordinance. The court cited, as a case directly in point, Holzbauer v. Ritter, 184 Wis. 35.

CONTRACTOR'S COURSE WHERE QUESTIONABLE WHETHER MATTER IS COVERED BY CONTRACT

Where the municipal representative, without collusion and against the contractor's opposition, requires the latter to do something as covered by his contract, and the question whether the thing required is embraced within the contract is fairly debatable and its determination surrounded by doubt, the New York courts hold that the contractor may comply with the demand under protest and subsequently recover damages if it turns out that he was right and that the thing was not covered by his contract; and on the other hand, if the thing required is clearly beyond the limits of the contract, the contractor may not, even under protest, do it and subsequently recover damages, Borough Const. Co. v. New York, 200 N. Y. 149, 157, followed in Ajax Drainage Contracting Corp. v. New York, 125 Misc. 794, 211 N. Y. S. 712, holding a sewer contractor entitled to recover for work necessitated by a change of the plan of construction of the sewer by the city engineer.

ASSESSMENT OF PROPERTY ON WHICH HOUSING CORPORATION HAS FIRST LIEN HELD INVALID

The United States Housing Corporation, a corporate agency owned by the United States, at the close of the war sold certain real estate, and as required by the statute authorizing the sale, reserved a first lien on the property for the unpaid purchase money. The Circuit Court of Appeals, Third Circuit, holds that a tax assessment on the property by a municipality was invalid. United States v. City of New Brunswick, 11 F. (2d) 476.

ASSESSMENT WHERE BID INCLUDES KEEPING PAVEMENT IN REPAIR

While a city may not assess the abutting property owners for more than the original cost of paving a street, all repairs being an obligation of the city as a whole, it is held, Segfried Const. Co. v. New York, 214 N. Y. S. 385, that a proposal for bid which included "keeping the pavement in repair for five years" did not invalidate the assessment where a comparison of the bid with one where no such obligation was imposed showed the same figure, indicating that there was actually no assessment on the property owners for the repair of the street.

CITY ENTITLED TO MANAGE ROAD TAX FOR ROAD DISTRICT WITHIN ITS LIMITS

The Oregon Supreme Court holds, City of Astoria v. Cornelius, 240 Pac. 233, that a statute expressly providing for the expenditure of funds on county roads and improved streets within the boundaries of municipalities precludes the contention that the legislature did not intend to provide revenue for the construction and maintenance of streets within the municipal limits. A provision of the statute that 70 per cent. of the road funds shall be used upon the highways in the territory embraced within the road districts in the class of counties provided for, a part of which districts is composed of municipalities, is held to be just and legal. Where the area within the limits of a city was a road district, the city was entitled to have at least 70 per cent. of the road tax under the management of the city officials for the improvement and repair of county roads and for the repair and maintenance of improved streets within the city boundaries.

CITY LIABLE FOR PUBLICATION OF PAVING IMPROVEMENT NOTICES THOUGH IMPROVEMENT STOPPED

The Oklahoma Supreme Court holds, City of Durant v. Story, 240 Pac. 84, that where a city, acting under the statute, commences proceedings to pave certain streets, and has published the necessary notices, ordinances, letting of contracts for paving, and before the paving is done the citizens protest down the paving, or the city is enjoined from proceeding with it, the city is liable to the printer for his fees for publishing the notices and ordinances, and to the newspaper publishing them.

IMPROVEMENT CONTRACT FINAL AS TO PRICE IN ACTION FOR ASSESSMENT

The Oklahoma Supreme Court holds, City of Pauls Valley v. Carter, 234 Pac. 617, that where a contract for public improvements has been let pursuant to the applicable statutory provisions by ten proper city authorities to the "lowest and best bidder" and is within the engineer's estimate, and jurisdiction of the subject-matter has been obtained by the proper municipal authorities, and all the resolutions and proceedings required by law have been regular, and bids have been received, and the contract let under the notice required, such action is final as to the contract price in the absence of fraud, collusion or mistake. After the contractor has expended money and labor on the contract, a property owner cannot defeat the assessment by proof of extraneous facts tending to show fraud of which the contractor had no knowledge. A mistake in the engineer's estimate of the cost of the improvement would not prevent the assessment.